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PRINCIPAL CONTENTS.

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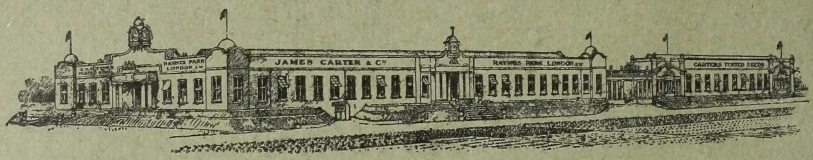

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THE JOURNAL OF THE BOARD OF AGRICULTURE

Vol. XVIII. No. 11.

FEBRUARY, 1912.

AGRICULTURAL EDUCATION IN ENGLAND AND WALES.

THE following memorandum of revised arrangements between the Board of Agriculture and Fisheries and the Board of Education in regard to agricultural education in England and Wales, has recently been issued. [Cd. 6039, price ½d.]

We have had under consideration the arrangements for the promotion of agricultural education made by our predecessors as Presidents of the Board of Agriculture and Fisheries and the Board of Education, and published in the memorandum [Cd. 4886] of the 22nd of September, 1909; * and have come to the conclusion that, in view of the large additional sums which have become available since 1909 for the purposes of agricultural education and research under the Development and Road Improvement Funds Act, 1909, those arrangements now require some modification. It no longer appears possible to delimit the spheres of work of our two Boards by assigning to the Board of Agriculture the responsibility for the Universities and Colleges in which advanced work is being done, and to the Board of Education the responsibility for Farm Schools and such other provision for agricultural education as is on a lower plane than that of Agricultural Colleges. It has, therefore, been decided that, in future, the responsibility for Farm Institutes, as well as for the agricultural work of Universities and Colleges, shall be transferred to the Board of Agriculture, and that this Board shall be regarded as the Government Department concerned with this branch of educational work for the purposes of the Development Fund. The application for an advance from

* *Journal*, Oct., 1909, p. 529.

the Development Fund in aid of Farm Institutes, which has been made by the Board of Education, will therefore be withdrawn by them, and the Circular 778 on "Aid from the Development Fund for the provision and maintenance of Farm Institutes" issued by them on the 14th of July last is hereby cancelled. A fresh application for an advance in aid of Farm Institutes will in due course be put forward by the Board of Agriculture.

Frequent consultation and co-operation between the two Boards and their respective officers will be still necessary under the redistribution of functions, and the existing arrangements will be simplified and strengthened.

(Signed) WALTER RUNCIMAN,
President of the Board of Agriculture and Fisheries.

(Signed) JOSEPH A. PEASE,
President of the Board of Education.

19th January, 1912.

THE FEEDING OF FARM STOCK.

CHARLES CROWTHER, M.A., Ph.D.,
Leeds University.

THE object of this and subsequent articles is to furnish guidance in the feeding of the various classes of farm live-stock, and more particularly in the compounding of rations. It cannot be too clearly emphasised at the very outset that the first essential for complete success in feeding is a good animal—good in applying food to the purposes for which it is supplied. No system of feeding will convert poor stock into good stock.

The science of animal nutrition is not yet sufficiently developed to permit of the reduction of the construction of rations to a set of precise rules, nor indeed is it likely that such simplicity can ever be attained. It has been truly said that it is the eye of the feeder that fattens his stock. Intelligent observation of the effects of the ration upon the well-being of the animal, and a practical acquaintance with the peculiarities and general requirements of each class of stock, must long remain the prime essentials for the attainment of efficiency with economy in feeding. Moreover, the feeder must be

familiar with the nature and special characteristics of the different foodstuffs from which he may choose.*

It is nevertheless possible to lay down the broad lines upon which the construction of rations should be based and to indicate the standards of feeding which accord best with present-day scientific knowledge and good practice. These articles are intended to supply guidance of this character rather than to formulate any code of rules to be rigidly adhered to in all cases. It is quite possible that rations which do not comply closely with the standards laid down in the following pages may prove successful in practice, but in such cases the success is frequently accompanied by unnecessary strain upon either the pocket of the feeder or the physiological activities of the animal.

For convenience of treatment the subject-matter is divided into four parts, as follows:—

PART I.—The General Principles of Nutrition.

PART II.—The General Feeding Characteristics of different Classes of Stock.

PART III.—The Compounding of Rations.

PART IV.—Typical Rations and Suggestions for the Feeding of different Classes of Stock.

Part I. is dealt with in the present article. The remaining parts will appear in subsequent numbers of this *Journal*.

PART I.—THE GENERAL PRINCIPLES OF NUTRITION.

Foodstuffs are composed of a variety of ingredients commonly grouped under the headings Albuminoids (or Proteins), Amides, Oils (or Fats), Ash, Crude Fibre, and Soluble Carbohydrates. For information as to the nature and characteristics of these substances as food the reader is referred to Leaflet No. 74, pp. 2–5.

Before food can be of any use to the animal, it must undergo the change commonly referred to as *digestion*. This is a complex series of processes, partly mechanical and partly chemical. The object of the mechanical changes (mastication, &c.) is to reduce the food to a fine pulp, in which state it is most readily acted upon by the chemical digestive forces. These are brought to bear upon it through the agency of

* Information upon these points is given in Leaflet No. 74, on "The Purchase of Feeding Stuffs."

various ferments (or enzymes) contained in the digestive juices (saliva, gastric juice, pancreatic juice, bile, &c.) with which the alimentary tract of the animal is, under normal conditions, liberally provided. In the latest stages of the passage of the food through the animal further digestive action is effected by living bacteria, whose action, however, is more wasteful than that of the enzymes.

The general effect of these various processes is to change as large a proportion as possible of the different nutrients into soluble forms, which then pass directly or indirectly into the blood stream, and are made to serve the various requirements of the animal.

The matters removed from the food in this way are said to be *digested,* whilst the residue which resists the digestive forces—the undigested matter—is eventually ejected from the body in the solid excrement or dung.

It is obvious, therefore, that *only the digestible portion of foodstuffs can have any direct feeding value,* and hence the value to the animal of a foodstuff is determined primarily not so much by its total content of albuminoids, oil, &c., as by the proportion of these present in digestible form (see Leaflet No. 74, p. 5). Although the indigestible matter cannot supply nutriment to the animal, it may influence the efficiency of digestion in other ways, *i.e.*, by exerting a beneficial stimulus upon the walls of the digestive organs or by swelling the bulk of the food up to a proportion that is best suited to the capacity of the stomach and bowels.

Similarly also certain pleasant-smelling or sharp-tasting substances that are present in small quantities in many foodstuffs (*e.g.*, hay, roots, malt coombs, treacle), although they have no direct nutritive value, add so greatly to the aroma and palatability of these foods that they are commonly accredited with an appreciable beneficial influence upon the utilisation of the food by the animal—especially in the case of milk-production.

These indirect effects of indigestible matter and of "stimulants" are, however, so vague and incapable of measurement that it is safest to regard them as insignificant in comparison with the direct value of the digested nutrients.

The table on page 901 gives an indication of the proportions

COMPOSITION AND NUTRITIVE VALUE OF VARIOUS FOODS.

	Total Dry Matter.	Digestible.				Starch Equivalent per 100 lb.†	Albuminoid Ratio.
		Albuminoids.		Oil.	Carbohydrates + Fibre.		
		Crude.*	True.				
	%	%	%	%	%	lb.	
Cottonseed cake { Decorticated	92	35·5	34	8·5	20	71	1 : 1·2
Undecort. Egyptian..	88	16·5	15·5	5·3	20	40	2·1
,, Bombay ...	88	15	14	4	21	37	2·2
Linseed cake	88	26·5	25	9·5	32	76	2·2
Cocoanut cake ... — ...	89	17·5	17	9·5	39	78	3·7
Soy bean cake	88	37	34	5·5	22	67	1·1
Soy bean meal, extracted	88	39	36	1·8	24	61	0·9
Soy beans	89	31·5	28·5	15·5	20	82	2·1
Linseed	91	18	17	34	21	119	6·1
Locust bean meal	86	4·3	3·5	1	70	73	21
Maize germ meal	90	12·5	8·5	10·5	55	85	9·4
Gluten meal	90	35	33	3·5	42	77	1·6
Gluten feed	90	23	21	2·5	52	74	2·8
Rice meal	90	7	6	10	42	70	10·6
Malt culms or coombs	90	18·5	11·5	1·5	39	40	4·1
Malt	92	8	6	2	63	70	11·5
Oatmeal	90	11·5	10	7	48	72	6·4
Wheat middlings	88	13	12	3	56	74	5·3
,, sharps	88	12·5	11	3·5	50	58	5·4
,, bran, coarse	87	12	10	3	45	47	5·2
Brewers' grains (wet) fresh... ...	24	4·2	4	1·3	10	15	3·8
,, ,, (dried)	91	14·7	14	5	35	50	3·8
Treacle or Molasses	78	5·5	—	—	55	48	—
Meat meal	89	70	67	12·5	—	94	0·5
Wheat	87	10	9	1·3	65	73	7·6
Barley	86	7·2	6·7	1·9	64	74	10·2
Oats	87	10	'	5·3	45	63	6·3
Rye	87	10	9	1	65	72	7·6
Maize	89	7·5	7	4·5	68	84	11·1
Beans	86	22	19	1·2	48	67	2·8
Peas	86	19·5	17	1	53	70	3·3
Straw, wheat	86	0·4	0·2	0·4	34	12	175
,, rye	86	0·6	0·4	0·4	35	11	90
,, barley	86	1	0·7	0·5	40	19	59
,, oat	86	1·3	1	0·5	39	19	40
,, bean	82	4	3·2	0·5	36	19	11·8
,, pea	86	4·3	3·4	0·7	32	15	10
Meadow hay, medium quality ...	86	5·5	4	1	41	31	11
Clover hay, ,, ,, ...	84	8·5	5·5	1·5	38	31	7·9
Pasture grass, young	20	3	2	0·5	10	12	5·9
,, ,, old	25	2	1·5	0·5	13	11	9·6
Clover (green)	19	2·5	2	0·5	9	10	5·2
Vetches ,, ...	16	3·5	2	0·3	7	8	4·4
Lucerne ,, ...	24	3	2	0·5	9	10	5·4
Cabbage	15	2	1·5	0·5	7	9	5·6
Rape	14	2	1·5	0·5	6	8	5
Turnip tops	12	1·5	0·5	0·2	5	6	12·4
Turnips	9·5	0·6	0·2	0·1	6	6	32·5
Swedes...	11·5	1·2	0·3	0·1	8	7	30
Mangolds	12	0·8	0·1	0·1	9	7	98
Carrots	13	0·8	0·4	0·1	10	9	26
Sugar beet	25	0·9	0·3	0·1	20	15	70
Jerusalem artichokes	20	1·0	0·4	0·1	16	16	41
Potatoes	25	1·1	0·1	0·1	19	19	200
Milk—Cow's whole	12·5	3·3	3·3	3·7	4·7	16	4·1
,, ,, skimmed	9·5	3·3	3·3	0·7	4·5	9	6·5
,, ,, separated	9	3·5	3·5	0·1	5	8	1·5
,, ,, buttermilk	9·5	3·7	3·7	0·7	4·2	9	1·6
,, Ewe's	18	6	6	6·5	4·8	26	3·4
,, Mare's	9·5	2	2	1·3	5·7	11	4·4
,, Sow's	18	6	6	6	5	25	3·2
Whey (from cow's milk)	7	1	1	0·3	5	6	5·7

* The "crude albuminoids" include true albuminoids together with certain other nitrogenous substances ("amides") that are of less value to the animal.

† The figures in this column represent the weights of starch that are equivalent, for fattening or other productive purposes, to 100 lb. of the foodstuff of the composition given. They have been calculated by a method devised by Kellner (see *Journal*, Dec. 1911, p. 721).

of the different nutrients present in digestible form in average samples of the commoner feeding-stuffs, together with other information, the use of which will be explained subsequently.

The varied functions that the digested nutrients are required to sustain in the animal may be summarised briefly as follows:—

(a) *Supply of Heat.*

The temperature of the body must not fluctuate to more than a very slight extent if normal health is to be maintained. The losses of heat from the body—for the body is almost continually warmer than the surrounding atmosphere, and hence radiates heat—must therefore be made good by the production of heat in the body from the food.

(b) *Supply of Mechanical Energy.*

Even in the case of an animal completely at rest, a certain amount of mechanical energy is needed for the performance of the indispensable internal work of the body (*e.g.*, for maintaining the movements of the heart, lungs, &c.), and for the labour involved in the mastication and transmission of the food through the digestive system. The performance of this work demands a supply of energy just as surely as the movements of a steam-engine are dependent upon a steady supply of mechanical energy in the form of expanding steam.

(c) *Supply of materials to make good the normal wear and tear of the vital processes.*

In other words, the live-weight of the animal must be maintained. All vital activity involves the destruction of various ingredients of the body, and it is obvious, therefore, that unless the materials so lost be replaced the animal must lose flesh rapidly and will sooner or later die of exhaustion. This replacement can only be effected by materials digested from the food-supply.

All the foregoing requirements are fundamental, and hold good for all classes of animals. In many cases, however, there are still further requirements that the food must meet, viz.:—

(d) *Supply of material necessary for the support of any productive activity of the animal.*

In all cases where the animal is either producing new substance (*e.g.*, growth, in the case of young animals; fattening increase, milk, wool, &c.), or is expending mus-

cular energy upon the performance of work other than that included under (*b*) (External Work), this extra task can only be provided for by the supply of correspondingly increased amounts of digestible nutrients.

The requirements summarised in (*a*), (*b*), and (*c*) may be referred to as the "maintenance requirements." A ration which satisfies these requirements without leaving any margin for the productive purposes summarised under (*d*) may therefore be described as a "maintenance ration." It represents the minimum supply of food upon which the animal, when completely at rest, can sustain a normal existence without losing weight. Among animals of the same class it will be roughly proportional to the live-weight of the animal.

Any food supplied in excess of the maintenance requirements can be utilised by the animal with varying efficiency for the productive purposes outlined under (*d*), and may therefore be described as the "production ration," or the productive part of the total ration.

It is obviously impossible in the case of young growing animals to draw any such sharp distinction between maintenance and production, since there can be no "marking time" in the growth of the animal, such as simple maintenance would involve. In the case of full-grown animals, however, it is profitable to keep this distinction in mind in constructing rations; thus the maintenance requirements of a cow remain practically the same whether she yield two gallons or four gallons of milk daily. It is the production requirements that are halved when the milk-flow is halved, not the total requirements. Similar considerations apply also in the case of working animals.

The various ingredients (albuminoids, oils, &c.) of foods are not of equal value to the animal for the discharge of the requirements summarised above. There are, indeed, certain purposes (included in (*c*) and (*d*))—viz., purposes which involve the production of albuminoids in the body, such as the production of muscular tissue (lean meat), hair, skin, &c., or of the albuminoids present in the various body fluids and secretions—that can only be supported by albuminoids * in

* There is reason to believe that albuminoids may be partly replaced by "amides," but it is doubtful whether rations entirely free from albuminoids could be entirely satisfactory, even though rich in "amides."

the food. For these purposes oils and carbohydrates are absolutely valueless. Every ration, for any class of stock, must therefore contain a certain amount of digestible albuminoids, the minimum amount requisite varying according to the class of stock and the character and amount of the "amides" and digestible carbohydrates by which the albuminoids are accompanied.

For all other purposes digestible albuminoids, oils, and carbohydrates are, to a great extent, mutually replaceable in proportions that vary somewhat according to the use to which the nutrient is put in the animal. Thus, for the production of *heat* in the animal (and in general for maintenance purposes) one pound of digested oil goes as far as $2\frac{1}{3}$ lbs. of digested carbohydrates (starch or sugar), or nearly 2 lbs. of digested albuminoids. For the production of *animal fat*, or for the performance of *mechanical labour* (or for productive purposes in general) the relative values of digestible oil and carbohydrates remain much the same as for heat-production, but the albuminoids are for these purposes slightly inferior, or at most equal to carbohydrates. These relative values may be summarised as follows:—

RELATIVE VALUES (Starch = 1).

	Dig. Carbohydrate.	*Dig. Albuminoid.*	*Dig. Oil.*
For maintenance	1	1·25	2·4
,, production...	1	0·95	2·4

As regards the digestible *fibre* of foods, for the production of heat in the body this is practically equal to the more easily dissolved carbohydrates; for the production of fat or mechanical energy, however, its value is largely dependent upon its mechanical condition. If the fibre be very hard, tough, and difficult to masticate, such nutriment as the animal extracts from it will be mainly required to supply the energy necessary to support the prolonged mastication, so that in this condition it will be practically valueless even to the classes of stock (ruminants, *i.e.*, cattle and sheep) best adapted for dealing with it. The more thoroughly it is reduced to a soft, easily masticated condition, however, before being supplied to the animal, the more nearly will it become equal to carbohydrates for productive purposes also.

From the foregoing it will be observed that albuminoids are capable of fulfilling all the functions of food, whereas oils,

carbohydrates and fibre can only serve for the production of heat, mechanical energy, and fat or other non-nitrogenous materials (*e.g.*, milk-sugar). It is theoretically possible, therefore, to satisfy the requirements of animals with a purely albuminoid diet, but in farm practice this is neither attainable nor desirable, since albuminoids are both expensive to supply, and if fed too liberally are liable to cause serious derangement of health. Moreover, it has just been pointed out that for the production of heat, energy, and fat, albuminoids are far inferior to oils, and little if at all superior to carbohydrates, whereas their digestion and utilisation place a greater strain upon the system. It is thus desirable for many reasons that the supply of albuminoids in the food shall be kept down as far as possible to little more than the minimum amount necessary to support those functions that other nutrients cannot support. Exceptions to this rule arise in the feeding of young stock and working animals, and will be dealt with later.

The fate of the albuminoids within the body is largely influenced by the amount of carbohydrates, oil, and other non-albuminoid matters by which they are accompanied in the ration. It is customary to group together all these digestible non-albuminoid matters in one quantity, the oil being multiplied by 2·4 (or, say, $2\frac{1}{2}$) in order to make due allowance for its high nutritive value. The ratio of the digestible albuminoids to the sum of the digestible non-albuminoids arrived at in this way is then referred to as the "albuminoid ratio." For example, a sample of oats containing 8 per cent. of digestible albuminoids, 4 per cent. of digestible oil, and 47·4 per cent. of digestible carbohydrates (and fibre) will have an albuminoid ratio of 1 to 7·1, arrived at thus :—

$$\frac{(4{\cdot}0\times 2{\cdot}4)+47{\cdot}4}{8} = \frac{9{\cdot}6+47{\cdot}4}{8} = \frac{57{\cdot}0}{8} = \frac{7{\cdot}1}{1}.$$

In the case of a few foods (treacle, potatoes, "roots," malt coombs), the "amides" are relatively abundant and need to be taken into account in calculating the ratio. The common practice is to regard them simply as heat-formers, with a value for this purpose about three-quarters of that of the carbohydrates. For example, the albuminoid ratio of swedes containing 0·3 per cent. of digestible albuminoids, 0·5 per cent. of "amides," 0·1 per cent. of digestible oil, and 8 per cent. of digestible carbohydrates (and fibre) will be 1 to 29, thus :—

$$\frac{(0{\cdot}5 \times \frac{3}{4}) + (0{\cdot}1 \times 2{\cdot}4) + 8{\cdot}0}{0{\cdot}3} = \frac{0{\cdot}38 + 0{\cdot}24 + 8{\cdot}0}{0{\cdot}3} = \frac{8{\cdot}62}{0{\cdot}3} = \frac{29}{1}.$$

It is customary to speak of a "wide" ratio or a "narrow" one, according as the proportion of carbohydrates, &c., to albuminoids is high or low. Thus a ratio 1 : 4 would be described as narrower than 1 : 8.

It was at one time thought that the maintenance in the ration of a definite albuminoid ratio, characteristic for each class of stock, was a matter of considerable importance in feeding. Practical experience, however, has long demonstrated that the ratio may be varied widely without materially affecting the success of the feeding, provided only that the ration supplies a *sufficiency* of albuminoids and is suited in other ways to the animal. The ratio may still be used, however, as a convenient means of representing the relative richness in albuminoids of different foodstuffs or rations.

If the albuminoid ratio be much wider than 1 : 8 (or, in the case of pigs, 1 : 10), a portion of the digestible carbohydrates will pass away undigested, and waste will ensue. In any case it must be borne in mind that the wider the ratio, the greater will be the weight of food that the animals must consume in order to secure the necessary minimum amount of digestible albuminoids.

VARIETIES OF WILLOWS.*

W. PAULGRAVE ELLMORE and THOMAS OKEY.

MUCH has from time to time been written on the botanical side of this subject, but such information is of small practical use to growers or workers.

The description given below of the choicest known varieties of willows for basket-making purposes,† is, therefore, written exclusively for the guidance of the practical grower, and not from the botanical point of view.

Salix triandra.—Salix triandra is a species embracing numerous varieties, known to the basket-maker as fine tops, in contradistinction to the many varieties of the common

* Previous articles on the cultivation of Willows have appeared in this *Journal* as follows:—April, 1911, p. 12; June, 1911, p. 207, and Oct., 1911, p. 557.

† Mr. Ellmore states that all the varieties described are now growing at Loughborough, near Leicester, where the nursery and adjoining willow ground of 20 acres can be visited (by appointment) by botanists, willow cultivators, or basket manufacturers.

osier (*Salix viminalis*), known as full tops. The former species supplies the varieties most suitable for peeling white or buff as one-year-olds. Many varieties of *triandra* are less suitable for two-year-olds, owing to closeness of the grain of the wood and the limited growth made in one season by the choicest sorts. Some of the largest-growing varieties of this group are more open in the grain, and consequently better suited for providing the larger rods required by basket-makers. After standing on the head three years this species sheds its bark, a feature not common to other kinds of *Salix*, and perhaps affording the readiest method of identification. All varieties of this species thrive on a cool, strong loam, and make the best growth in a wet season. In a dry period they are very liable to honey fall, green fly, and blight.

The following are varieties of *Salix triandra* :—

1. "Black Maul," a variety believed to have been brought prominently to the notice of the trade by a practical worker named Maul in Leicestershire, is one of the best willows for all kinds of baskets subjected to long and hard service. It is extensively and chiefly grown in Leicestershire and Nottinghamshire; shoots, 4 ft. to 6 ft. 6 in. long; requires a rich, loamy soil, with strong, cool sub-soil; is a heavy cropper, and always realises good prices—£4 to £5 per ton as green, and £22 to £24 per ton as white or buff. Plant 18 in. by 18 in. For the first two years this willow has a tendency to grow curly-butted (with a bend at the butt-end), but as the heads get established and the produce heavier, this objectionable feature disappears, owing to the more confined air space. Consequently close planting is necessary in order to secure a straighter growth.

2. "Black Italian," a superior and harder willow, thrives best on a damp, alluvial loam, and its fertility is increased by temporary floods. A "shy" cropper, it is not extensively grown, except on land especially suited to it, when it will produce six or more tons of one-year-old green to the acre. This realises high prices, and is much sought after by makers of the finest baskets or chairs in buff or white. As buff, its colour is a rich, dark gold, and it whitens equally well. £25 per ton is not an unusual price for white or buff. Plant 18 in. by 18 in.; shoots, 3 ft. 6 in. to 6 ft.

3. "Black German" ranks amongst high-class willows, and is easily recognised by a wavy appearance in the growth of the shoot. Less hard than some of the varieties, it is suited to a medium loam with good drainage; it will resist blight and thrive through a dry period better than many other varieties of *S. triandra.* Shoots, 4 ft. to 7 ft. long, a heavy cropper, and straight at the butt. This willow often cuts six to seven tons to the acre, worth as green £4 per ton, or as white £20 to £22 per ton. It does not strip well for white from the water, and peels best when cut from the head about May 1st and laid in the pie for sweating.* Produces a good buff. Plant 18 in. by 18 in.

4. "French," like many of the varieties of this species, produces both light and dark coloured rods. A superior working willow; shoots, from 4 ft. to 6 ft. long. Equally suitable for white or buff. Thrives on upland soil, and does not require so much moisture as many other varieties of the *triandra.* A liberal producer, and ready seller at good prices. As green it realises £4 to £4 10*s.* per ton; white or buff, £22 to £24 per ton. Plant 18 in. by 18 in. (This must not be confused with the "French Osier" *S. viminalis.*)

5. "Pomeranian," a variety imported and highly prized by the late Mr. William Scaling. A high-class willow closely resembling "French," less vigorous in growth, but harder in quality; an ideal willow for straightness; long and slender; shoots average from 3 ft. to 5 ft.; admirably adapted for the finest willow work. Equally suited for white or buff, and a ready seller at high prices. As white, the writers have known it realise £28 per ton. Plant 18 in. by 18 in.

6. "Mottled Spaniards." The best of the Spaniards, and quite different from a rod called by the same name and grown in East Anglia. Is easily distinguishable by small red blotches, producing a mottled appearance on the upper part of the rod, when the growth is completed and the wood ripe. A heavy cropper; shoots, 5 ft. to 7 ft. 6 in. long; fairly sound quality; makes useful two-year-olds; suited to all general work; prefers a damp, cool warp or loamy soil, well drained; and makes equally good white or buff. Plant 20 in. by 20 in.

7. "Lincolnshire Dutch," a vigorous grower closely re-

* Details of this method will be given in a later article.

sembling "French," described above, and chiefly grown in the watershed of the Trent and the Gainsborough district; much prized by growers of that locality as a good cropper. Thrives well on a heavy warp land, subject to freshets of water. Not esteemed by the basket-maker as a first-quality willow. Shoots, 4 ft. to 6 ft. 6 in. long; plant 18 in. by 18 in.

8. "Stone Rod," the hardest-wooded of this species, makes the choicest white. Its natural defect is that it grows so bent at the butt—a feature associated with all the very best-quality rods, and counteracted by a system of close planting, which compels the shoot to grow upwards for light and air. This willow thrives in the valley of the Severn and some parts of Gloucestershire. It has been tried on several kinds of soil in Leicestershire, but with comparatively little success; it is a "shy" cropper, but very valuable. Shoots, from 2 ft. to 5 ft. long. Suited to a damp, alluvial, warpy, clay soil. Plant 16 in. by 16 in. Mr. A. Slater, Chief Forester to Earl Beauchamp, sent to one of the writers in the spring of last year some very fine rods measuring over 6 ft. in length, and states that this variety pays better than anything else, and meets with a ready market.

9. "Brittany Green," a beautifully slender rod of great length for its substance, was brought from France and planted at Loughborough, Leicestershire, in the spring of 1911, on a rather dry, rich loam, or marl soil, 18 in. by 18 in. In spite of the severe drought of 1911, it wholly escaped the blight, from which so many of the *triandra* group suffered, and at the end of July had made a satisfactory and healthy growth. It is too early to speak of its working quality, but in France it is classed as first quality. Shoots, 3 ft. 6 in. to 6 ft. 6 in.

10. "Rayns's Ten-feet," a vigorous and heavy cropper of the Spaniard class. Attains a length of from 6 ft. to 10 ft., and is principally employed for white hamper work. Suited to a damp, cold loam. Plant 20 in. by 20 in.

11. "Black Holland," one of the largest and longest of this species, is believed to have been brought by the Dutch and planted first in the East Anglia low country, where it thrives better than on the watersheds of Leicestershire and Notting-

hamshire. On a favourable soil it is a vigorous and heavy cropper. The shoots are 6 ft. to 8 ft. long, and it makes an excellent two-year-old white. Grows best on strong warp land. Plant 22 in. by 22 in. for one and two years' growth, or, if for covert purposes, 24 in. by 24 in. As brown or white for large and strong gardeners' baskets it is much sought after. If the shoots are left on the head for three-year-olds they make excellent sticks, for which there is an ever-growing demand, either as brown, white, or buff.

12. "Glib Skins," a name given by growers in the Fen country to a variety closely allied to the Brown Norfolk, is largely grown in Hunts. and the Isle of Ely. It is regarded as an excellent willow for all kinds of market gardeners' baskets. A heavy cropper, and suited to very damp, warp land. Shoots, 5 ft. to 7 ft. 6 in. long. It is often attacked by fly, which greatly reduces its market value. When the crop is sound it makes a good second-quality white, and yields a satisfactory return. Plant 22 in. by 22 in. If the shoots are left on the head for three years' growth they make excellent sticks.

13. "New kind" (light and dark), often called "Norfolks," is one of the best of the larger-growing varieties of *S. triandra* and a very heavy cropper. It is suitable for either white or brown, and as brown is mainly used for all work that requires a superior rod, *i.e.*, fitching, handling, and tying. It always commands a good price and a ready market in London or any district where brown goods are made. Well suited for growers who have no convenience for whitening. Shoots, 5 ft. to 8 ft. long. Suited to a damp, heavy loam or warp land. Plant 22 in. by 22 in.

14. "Long Bud," a variety introduced to Loughborough in the spring of 1911 from Berkshire, where it enjoys a high reputation for quality. By its appearance at the end of July it seems to be identical with the dark new kind described in the preceding paragraph. Is a very heavy cropper, and usually finds its market in London, where it is classed among the first of the large varieties of the *triandra* group. Planted, at Loughborough, 20 in. by 20 in.

Salix amygdalina.—This is extremely difficult to differentiate botanically from *S. triandra*, and in fact by some authori-

ties is considered to be a variety of *S. triandra*. So far as the working quality is concerned, the following three varieties are equally good, and belong to the fine-top class: "Brunette Noire, or Black"; "Grisette Droite, or Straight"; "Grisette Courbe, or Bent."

These are of French origin, and were first brought to this country in the spring of 1910. They are of excellent quality. The lengths attained are: Courbe, about 5 ft.; Droite, 6 ft.; and Noire, 7 ft. The Courbe variety requires a damp, rich alluvial loam or clay, whilst the Noire and Droite appear to do well on a cool loam. Planted, at Loughborough, 18 in. by 18 in.

Salix viminalis, or Common Osier.—This important species embraces many varieties, which differ very widely in their working qualities; in fact, many are not worth cultivation. *Viminalis* is a far more vigorous and hardy species than *triandra,* and is commonly known amongst basket-makers as a full-top rod, carrying as it does a more uniform size to the top than either *triandra* or *purpurea*. It is distinguished by the strength and length of the shoots, which, in some instances, reach 12 ft., and even longer, in one season. All varieties of this species are very accommodating in their habits, and generally do best in a dry season, providing the soil is fairly strong and cool; in fact, they will grow in almost any soil, from drift to clay, and make a vigorous growth in a wet period, although the quality of the wood is then deficient, owing to the rapidity of the growth.

After a connection exceeding forty years with this class of osier we recommend the following as fittest to meet all the requirements of the general basket trade:—

"Long Skin" (perhaps "Long Skein" would be the more correct term), when it is true to kind, is the closest-grained and the hardest-wooded of all the osiers, and makes the toughest skeins; but it gives rise to more contention with buyers than any other willow grown, since many growers who possess a good-quality osier persist in describing it as "Long Skin," in the hope of realising the fancy prices sometimes paid for the true sort. Although a vigorous grower, it seldom yields a smooth crop, being frequently damaged by the larvæ of insects, which cause the top of the rod to throw

out side-shoots. This defect, commonly known amongst basket-makers as rose-top, greatly reduces its value, and the variety is not grown extensively, owing to the uncertainty of the crop. Shoots, 4 ft. to 6 ft. 6 in. Good for white one- or two-year-olds, but scarcely equal to second-quality *triandra* for buff, unless grown on a strong clay soil. Plant 20 in. by 20 in.

"Brown Merrin" is a more lengthy rod than Long Skin, with the additional advantage that the fly does not attack it nearly so much; moreover, it generally grows smooth. When grown on strong clay it makes a good second-quality white one-year-old, or first-quality two-year-olds, or excellent brown. Shoots, 4 ft. to 7 ft., and a heavy cropper. Plant 20 in. by 20 in.

"The French Osier," first imported from France by Mr. Ellmore, is the best of the *viminalis* group grown in that country. In the North of France it is greatly prized as a skein rod. Shoots, 4 ft. to 8 ft. Plant 20 in. by 20 in. It should be understood that the term "Osier" is applied exclusively to the varieties of *S. viminalis;* thus, "French," described on p. 908, and "French Osier" are quite distinct.

"Yellow Osier," a fair cropper and invariably smooth, has been observed year after year to escape all attack by fly. The larger sizes make good second-class white, and the full crop excellent brown, when grown on strong upland or meadow clay soil. Shoots, 4 ft. to 7 ft. Plant 20 in. by 20 in.

"Reed Osier," so called from its great length and straight growth, is, with the "Continental Osier," the most vigorous known; it is most suitable for holding up river banks, for wild-bird coverts, or low, out-of-the-way places. Often reaches a length of 12 ft. in one season. After the heads are well established little attention is necessary, the foliage being dense enough to destroy the vegetable growth underneath. These two varieties provide the straightest and longest sticks grown, and when left for two or three years' growth command a brisk demand amongst all makers of basket furniture—a business which has developed into a great industry in this country, and which at present seeks its main supply of sticks from Germany. When cut as one-year-olds they make good brown, and supply a larger proportion of

staking than any other variety. Plant for one-year-olds, 22 in. by 22 in.; if for sticks, 26 in. by 26 in.

Salix purpurea.—*Salix purpurea,* or the bitter willow, embraces many varieties, the chief of which are the most slender for their length of all willows; it also includes the two extremes in size. The smallest, known as Dicks or Red Buds, are the toughest willows known, whilst others grow to 9 ft.; they are easily recognisable, since all are yellow on the inside of the bark, are very bitter to the taste, and show red eyes at the spring growth.

"Light Dick, or Dicky Meadows," supposed to have been first noticed by a man of that name in Lancashire, is a variety which runs along the ground like strawberry runners; it is a very beautiful rod, wiry, and a heavy cropper, but very difficult to keep clean, since the weeders must work unshod and with their feet clothed in some soft fabric in order to avoid bruising the shoots. Unsuitable for white, but makes very choice buff, and is now largely used in the making of tea and luncheon baskets; for all classes of fine buff goods it has no equal. Shoots, 18 in. to 5 ft. Will do equally well on drift or heavy soil, and is not affected by dry or wet seasons—a peculiar feature of all varieties of *purpurea.* Plant 16 in. by 16 in.

"Old Dicks, or Red Buds." Another variety in all respects like the above, except that it does not make so large a growth. Shoots, 12 in. to 3 ft. 6 in., and grows half upright. Plant 16 in. by 16 in.

"Dark Dicks," another of the same variety, grows longer than either of the above and upright; it is used for staking and also for skeins. Shoots, 2 ft. to 6 ft. Plant 16 in. by 16 in. This and the preceding variety are in good demand as brown by the makers of ladies' hand-baskets.

"Kecks'," a long, slender, and very tough rod, and one seldom attacked by ground game, owing to the extremely bitter character of the bark, contains more salicine than any other willow; its bark is said to be an excellent remedy against fever and is valuable as a tonic. This variety is useful for making fences by lacing long two-year-old cuttings into a trellis. A trellis grown in this way proved in a few years capable of great resistance, and, in addition, yielded a

very profitable crop each year. It was not damaged by the cattle eating the shoots. This variety invariably grows quite smoothly, thrives equally well under dry or wet conditions, and has never been known to take the blight. Shoots, 3 ft. to 7 ft. Plant 18 in. by 18 in. Makes a good light-colour buff, or brown. For binding purposes (as used by nurserymen) this is the best and toughest willow grown, and a certain cropper.

"Welch." This was a variety supplied by the U.S.A. Government in March, 1910, at which time it certainly differed from the above in the outward appearance of its bark; but, after being planted for eighteen months, the apparent difference, as in so many other instances, promises entirely to disappear. Shoots, 3 ft. to 7 ft. Plant 18 in. by 18 in.

"Pyramidalis" is a tall, slender rod, sent to Mr. Ellmore from Germany as one of their best, and classed by a German botanist of repute as *purpurea*—a doubtful classification, since it makes a good-colour white, which no English *purpurea* will do. Plant 20 in. by 20 in. Shoots, 5 ft. to 8 ft.

The three following sorts, viz., "Lumley," "Patent Lumley," and "American Green," were supplied by the U.S.A. Forestry Department in March, 1910, and are stated to be the best suited to Transatlantic climatic conditions. They gave in 1911 a growth of 4 ft. to 6 ft. under a very dry and trying season, and have escaped the green fly, with which the adjoining varieties were badly troubled, owing to drought. They are good croppers and hardy, but their value as white or buff is doubtful.

The variety known as "Africans," is the best of two kinds largely imported into England. It does not make the same long growth as in its native country. A rich alluvial clay is suitable. Shoots, 4 ft. to 7 ft., at Loughborough; 4 ft. to 10 ft. in its native climate. A very suitable and excellent willow for warm, humid places. Plant 20 in. by 20 in.

Salix alba var. *vitellina*.—The variety known as "Golden Willow" is one of the toughest willows grown if used with the bark on in a green state. It is chiefly sold for tie-rods to market gardeners, for which there is a most active demand at Covent Garden, Spitalfields, and in market-gardening districts generally. Strong, damp, rich soil is required. Shoots,

3 ft. to 6 ft. 6 in. If peeled, the colour is dirty and the rods poor in quality. Plant 20 in. by 20 in.

Salix alba var. *cardinalis*.—The "Belgian Red Willow" is the best working-quality willow that Belgium produces, but is far inferior to the *triandra* varieties; it is a heavy cropper, but the shoots rarely exceed 5 ft. 6 in., and they do not make a good colour as white; it finds a ready market with gardeners as green for tie-rods, and is well suited for that purpose. Its great toughness lies in the bark. Plant 18 in. by 18 in. on a damp loam soil.

Salix hippophaefolia.—This willow is classed as a hybrid of *Salix viminalis* and *Salix triandra* by the Rev. E. F. Linton. It is certainly one of the best and hardest-wooded full-top willows grown. Whilst growing, the largest rods have a tendency to throw out side-shoots; but as these are usually of a tender character, they fall away during the winter season or at peeling time. Of all the willows tried on sewage farms, this alone has stood the test of time, and yields a quality equal to many rods produced under ordinary conditions. For all work where a full top is desirable, it is probably unequalled.

In addition to the above there are other varieties, known in the trade as Violets from the beautiful bloom on the bark (*S. daphnoides*), White Dutch, Gelsters, Russets, Wigstons, and a few other old-fashioned but good working rods, all of which thrive, without much care, if conditions are suitable to their requirements.

Experiments with Potatoes Resistant to Wart Disease.

THE experiments which were conducted on the cottage gardens and allotments in 1910, to test the power of resisting Wart Disease believed to exist in certain varieties of potatoes, were renewed in 1911. The centres selected were as follows:—Ravenglass and Carlisle in Cumberland; Rainford and Haydock near St. Helens, and Ormskirk in Lancashire; Hooton and Saltney Ferry in Cheshire; Alfreton in Derbyshire; Annesley and Newstead in Nottinghamshire; Hales near Market Drayton, Smethwick, Walsall,

Burton-on-Trent, Stafford, and Stone in Staffordshire; Sutton Coldfield in Warwickshire, and Redditch in Worcestershire. Wart disease is known to have been present recently in all these places, and in most of them the allotments are badly infected and incapable of yielding a good crop from the susceptible varieties of potatoes that are usually grown. The potatoes tried this year were Aberlady Early, Snowdrop, Southern Queen, Sutton's Supreme, Sutton's Abundance, Chiswick Favourite, Davie's Laird, Sutton's White City, Crofter, and Provost, and small quantities were distributed to allotment holders on condition that the potatoes were planted on soil known to be infected. The results have been on the whole very satisfactory, and every one of the varieties proved to be disease-resistant as a rule. One or two exceptions were reported, but as the specimens were destroyed before the Board were notified, the accuracy of the statement cannot be verified. Conditions may conceivably occur under which these varieties may become diseased, but there is no doubt that in the vast majority of places infected with Wart Disease they can be grown with the certainty that they will yield a sound crop.

When replies were being collected as to the freedom of these potatoes from disease, opportunity was also taken to collect the opinions of the growers as to their cropping qualities and their general suitability to the district. The reports in this case are of a much more varied character.

1. *Ravenglass.*—The soil here is a rich clay loam, and the only manure used was from the farmyard. The gardens in which the potatoes were planted had been badly diseased for at least four years. In one case two tubers of Aberlady Early were said to be infected, and the crop and quality were both poor. The other varieties grown here were satisfactory both as to yield and quality.

2. *Carlisle.*—Davie's Laird, White City, Chiswick Favourite, and Abundance gave very good returns on well-manured land. The quality was very highly spoken of. The others gave good returns, except in one instance where the potatoes were planted on much impoverished soil. Southern Queen, under these conditions, appears to be susceptible to disease.

3. *Rainford.*—The soil here has been badly infected for

many years. Sutton's Supreme was described as poor in cropping capacity, but generally good in quality. Davie's Laird was poor in one case, but good in another. All the others were good, White City and Abundance being very good. A further experiment was tried at this centre to see if the seed saved from the former year would be resistant in 1911. White City, Langworthy, Conquest, and Abundance were tried and not only proved resistant, but gave very good crops. It was observed in this district that the disease was less evident as well as later in appearance in 1911 than 1910, except in those parts of the plant which were exposed to the air.

4. *Haydock.*—All the varieties tried, with the exception of Aberlady Early, were declared to be very good or good in yield, and satisfactory as regards quality. The exception was described as very poor, and unsatisfactory. The proportion of small potatoes was large.

5. *Ormskirk.*—The results varied a good deal, probably as a result of the treatment of the soil, but on the whole they were all satisfactory both as to yield and quality, except Aberlady Early, which was described as hard and not good to eat.

6. *Hooton.*—All the varieties, except Snowdrop and Favourite, were tried, and were reported to be quite satisfactory, except Sutton's Supreme, which is evidently unsuitable to the soil. It was given a fair trial by a grower who took second prize for his garden. In this trial Aberlady Early was described as very satisfactory in every way.

7. *Saltney Ferry.*—The yield in every case was poor owing to the drought, but the quality was considered good in every case. The same varieties should evidently be tried again another year.

8. *Alfreton.*—The drought affected the returns in this district also, all kinds of potatoes having been a comparative failure. Davie's Laird is apparently the best resistant potato for this neighbourhood, and White City the least satisfactory, but all the varieties should be tried again.

9. *Annesley.*—All varieties were reported to be satisfactory. Crofter is apparently the most suitable to the district, but Supreme is also good. A little ordinary potato disease was reported.

10. *Newstead.*—None of the tubers were large owing to the

dry season, and the crop was not as good as it probably would have been in a more favourable summer. The quality of Davie's Laird is highly spoken of.

11. *Hales.*—The potatoes were all planted in a badly diseased cottage garden, but owing to the drought no satisfactory deduction can be made, except that they are disease resistant. Seed saved from the varieties Conquest, Langworthy, and Golden Wonder, planted in a former year, was tried. Conquest is said to be not only a good cropper, but a beautiful eating potato. The tubers of Langworthy were small, owing to the drought. Golden Wonder was unsatisfactory.

12. *Smethwick.*—The abnormal season seriously affected the experiment as regards the yield, and the potatoes will be tested again this year, but with one possible exception they are declared to be very satisfactory. The order in merit is given as follows:—Abundance and Supreme (grand table quality, quite clean), Crofter (fine large potatoes, good quality), White City (good quality, slightly subject to scab *), Davie's Laird (fine potatoes, good quality, heavy cropper), Chiswick Favourite (good cropper, fine flavour), Southern Queen (fine large potatoes, good quality), Snowdrop (fine flavour, but subject to scab *), Aberlady Early (good quality, but subject to scab *), Provost (somewhat abundant, very small, and bady affected with scab *).

13. *Walsall.*—Great interest was taken in the experiment in this district, and many small experiments were made in addition to those arranged by the Board. Langworthy, Peacemaker, What's Wanted, and Milecross Early were also tried. The following report was sent in: "Our soils vary very much, as they consist of peat, semi-peat, clay, semi-clay, *i.e.*, clay and gravel, marl (marl and sand), almost complete sand, and the results have been as varied in crops as the soils. Our greatest misfortune has been the drought. The results may be summarised as follows: Aberlady Early, failure in crop, except in three cases, kitchen quality, varied. Golden

* Described by the Board's correspondent as Corky Scab, but the diagnosis has not been confirmed, and it is possible that the appearance may really be due to mechanical action of the dry gritty soil on the skin of the tubers. Many varieties are subject to this "Scab," especially in dry weather, but it is not caused by any disease

Wonder: this varied from moderate crop in newly ploughed land to complete failure in ordinary gardens, kitchen quality, good throughout. Langworthy, with the exception of four cases, a failure, kitchen quality, varied. These are improving in quality as the winter goes on. What's Wanted, pretty general throughout, about two-thirds the quantity of the susceptible varieties, kitchen quality, no complaint whatever. Peacemaker, a complete failure both in crop and quality. Provost, rather disappointing in crop, but all that can be desired for the kitchen. Our best all-round variety has been Abundance, which has been true in quantity and quality."

14. *Burton-on-Trent.*—The yield in every case was small, owing to the hot weather of the summer. Abundance appears to have given most satisfaction. Davie's Laird is apparently not suitable to the soil. The flavour of Aberlady Early was praised, but the tubers were small.

15. *Stafford.*—The late frosts in the spring affected the productiveness of many of the varieties, but White City and Abundance appear to be suitable to the district. Both Aberlady Early and Provost gave good results in some cases and bad in others. All the varieties should be tried again.

16. *Stone.*—Only two reports have been received. The yield and quality were unsatisfactory, and the varieties should be tried again.

17. *Sutton Coldfield.*—The abnormal season made the crop a very poor one, in some cases not more than one-third of the previous year's season having been secured. Several growers have kept all their crop for seed next season. Crofter was most highly spoken of. Supreme, Abundance, and Provost rank next. The quality of Aberlady Early was unsatisfactory.

18. *Redditch.*—The yield was generally poor, owing to the drought and want of manure. Southern Queen gave a good crop of a good quality. Davie's Laird gave a fairly good crop, but the quality was not so good as Southern Queen. Aberlady Early gave a good crop, but appears to be unsuitable to the soil. The flavour was soapy.

THE destructive disease known as tomato-leaf rust, due to the parasitic fungus *Cladosporium fulvum,* Cooke, was first described by Dr. M. C. Cooke, from specimens received from North Carolina in 1883.

Tomato-Leaf Rust.

Its occurrence in this country was recorded by Plowright in 1887, when it proved very destructive to tomatoes grown under glass, in two different districts. Curiously enough, the fungus was not observed as a source of injury to tomatoes in the United States until the year 1888. It is now a well-known pest, attacking tomatoes in France and Italy also.

The leaves, stem, and occasionally the fruit, are attacked. The fungus usually first appears on the leaves, in the form of small scattered spots, which gradually increase in size and encroach on each other, until almost the entire under-surface of the leaf becomes covered with a minutely velvety, dull rust-coloured layer, consisting of the spore-bearing portion of the fungus, the spawn or mycelium being imbedded in the tissues of the leaf. The presence of the fungus is first indicated by the appearance of pale yellowish patches on the upper surface of the leaf, corresponding in position to infected areas on the under surface. These yellowish patches increase in size, in proportion to the spread of the fungus on the under surface, and gradually change through brown to almost black, often with a tinge of purple. The fungus forms long, rust-coloured, afterwards blackish streaks on the stem, and more or less circular, scattered patches on the fruit. When the fungus shows a rusty tinge, the leaves wilt and soon die, and as a rule the disease spreads very quickly. This, to a very great extent, is due to the usual method of spraying horizontally, so that the spores are forcibly driven from one plant to another. If by any means the water could be allowed to fall from above, after the manner of a steady rain, numerous spores would be washed on to the soil, where they would germinate and perish, instead of being lodged on the leaves of healthy plants, where they set up new centres of disease.

Spraying with fungicides is of very little avail, unless commenced the moment the disease first shows on the foliage. The reason for this is that no fungicide is a curative agent;

TOMATO LEAF RUST (*Cladosporium fulvum*, Cooke).

neither will it kill fungus spores. All that a fungicide can do is to form a film of some substance on healthy leaves, and act as a poison to any *germinating* fungus spores that happen to alight on the leaf. Success in this direction depends entirely on the method in which spraying is conducted, the object being to cover the entire surface of every plant with the fungicide. To accomplish this object even approximately, repeated sprayings are absolutely necessary.

If the plants are young, half-strength Bordeaux mixture may be employed. When flowers and young fruit are present, a solution of liver of sulphur, 1 oz. in four gallons of water, should be used.

Tenant Farmers and Changes in the Ownership of their Holdings.

A DEPARTMENTAL Committee was appointed by the President of the Board of Agriculture and Fisheries in March, 1911, to inquire into the position of tenant farmers in England and Wales on the occasion of any change in the ownership of their holdings, whether by reason of the death of the landlord, the sale of land or otherwise, and to consider whether any legislation on the subject is desirable.

The members of the Committee were:—The Right Hon. the Lord Haversham (Chairman); The Lord Clinton; Lord Ninian E. Crichton-Stuart, M.P.; Sir Frederick Cawley, Bart., M.P.; Sir Charles D. Rose, Bart., M.P.; Sir Edward H. Holden, Bart.; Mr. Colin Campbell, Chairman of the National Farmers' Union; Mr. Ellis W. Davies, M.P.; Mr. H. Trustram Eve, F.S.I., Secretary to the Farmers' Club; Hr. Howard Frank, F.S.I.; Mr. George Nicholls; Mr. Abel H. Smith; Capt. A. G. Weigall, M.P.; and Mr. James Parker, M.P.

The Committee have now presented a Report [Cd. 6030, price 4½*d.*], signed, subject to certain reservations in individual cases, by all the members except Mr. Trustram Eve, who has presented a separate Report. The Minutes of Evidence, Appendices and Index have been issued as a separate publication. [Cd. 6031, price 2*s.*]

Estates on the Market.—The Committee state that there is no doubt that an abnormal number of estates are being broken up and sold at the present time, and the Committee were

informed that agricultural land to the value of one and a half million pounds was disposed of during 1910, whilst in 1911 the value of the agricultural land sold exceeded two million pounds. Moreover, there seems every indication that the tendency to break up the large agricultural estates is likely to continue.

Causes of Increased Sales.—Among the causes to which this sale of estates was ascribed by the Committee are: (1) The feeling of apprehension among landowners (whether well founded or not) as to the probable tendency of legislation and taxation in regard to land. (2) The fact that in certain parts of the country land is at present let at rents below its present economic value. With a certain amount of increased agricultural prosperity, and the consequent demand for agricultural land for occupation purposes, landlords might be disposed to increase rents, but many find it preferable to sell. (3) Many agricultural estates are mortgaged more or less heavily, and at present prices a sale will often enable the vendor to pay off the mortgages and to retain an income in excess of what he has been receiving as owner of the land, and in other cases mortgagees are realising their securities. (4) The ownership of land entails heavy responsibilities, and, heretofore, landowners have in many cases been content with a comparatively small return on their capital, partly in consideration of the social position and amenities conferred by such ownership. Many owners, finding they are now in a position to sell to advantage, are relieving themselves of these responsibilities.

Position of Tenant Farmers on Occasion of Sale.—It is conceivable that on the sale of an estate the tenant may be placed in a very unsatisfactory position, and the evidence which the Committee heard proves that there exists great anxiety among tenant farmers, and that this feeling of insecurity is militating against agriculture.

For example, assuming that a tenant has to leave, he may lose a business connection such as a milk round, or a market for cheese, for which he may have built up a reputation. He has ascertained by experience the best method of working the farm which he is quitting, for another farm, the peculiarities of which he may take years to master. In addition, he may have succeeded in getting together a

number of useful farm labourers whom he will not be able to move to his new farm, whilst the greatest difficulty is that experienced by the tenant under present conditions in securing any other holding for occupation.

If the tenant elects to rent the farm under the new landlord, he is liable to be rented on any improvement which he has executed, without receiving any compensation. Unable to obtain another farm, he may perhaps agree to take the farm at an increased rent, at which he may not be able to farm profitably.

If to avoid dispossession the tenant decides to buy, he may be induced to bid at the auction up to a high price in order to retain his home, and, if he has executed improvements and farmed the land exceptionally well, the purchase price is often increased accordingly, with the result that he has to buy his own improvements.

Recommendations of the Committee.—The Committee make the following recommendations:—

(1) That the period of notice of intention to claim compensation for disturbance under Section 11 of the Agricultural Holdings Act, 1908, should be amended. At present the tenant is under an obligation to give notice in writing of his intention to claim compensation under the Section within two months of his receiving notice to quit, or being refused a renewal of the tenancy, and the Committee think that the early receipt by the landlord from the tenant of a notice of his intention to claim often has the effect of prejudicing the tenant in his negotiations with the landlord for a renewal of the tenancy. The Committee are of opinion that the landlord would be sufficiently safeguarded if the tenant were allowed to give notice of his intention to claim at any time up to a date two months before the determination of the tenancy, and the Committee recommend that legislative steps should be taken to amend the Act accordingly.

(2) That for the one year's notice required by Section 22 of the Agricultural Holdings Act, 1908, in the absence of agreement, for the determination of the tenancy of an agricultural holding, two years' notice should be substituted.

(3) That, except when notice to quit is given for one of the purposes referred to in Section 23 of the Agricultural Holdings

Act, 1908, or where the tenancy is for a period of twelve months or less, any agreement for notice to quit for less than twelve months should be made void by statute.

(4) That, in cases where a tenant receives notice to quit for the purpose of sale, the tenant should be empowered to serve a counter notice, claiming that the notice to quit shall not take effect until one year after the original notice would have expired. The Committee think that a tenant would thus be given time to negotiate with his new landlord or to make arrangements for obtaining another farm, and that this would go far towards removing any grievance under which the tenant labours at present.

(5) That the Small Holdings Act, 1910, should be amended to provide for payment of compensation for disturbance in all cases where land is actually acquired for small holdings, in addition to those cases where the tenancy is determined by a notice to quit given by the Council, or by a landlord at the request of the Council.

(6) That, if special legislation be enacted for Wales, effect should be given to certain recommendations of the Welsh Land Commission * as to compensation for improvements, unanimously adopted by them.

State-Aided Purchase.—(7) That a scheme of State-aided purchase should be instituted on the lines of a scheme proposed by Sir Edward Holden providing for the establishment of a Land Bank or Institution to lend money to the farmer to enable him to purchase his holding. It is proposed that the directorate of the institution should consist of representatives of three departments of the State—the Treasury, the Board of Agriculture and Fisheries and the Board of Trade—a member of the Government, an agricultural land agent, two practical bankers, and a practical farmer. In order to assist the institution in its transactions, it is suggested that an advisory committee consisting of two or three members should be set up in each of the different districts where land is likely to come into the market. It is recommended that the State should advance the sum of £500,000 to constitute the capital of the bank or institution, which will pay the State $3\frac{1}{4}$ per cent. interest on the loan, this interest to be cumulative. The

* Welsh Land Commission Report, Cd. 8221.

institution will then lend to the farmer four-fifths of the purchase money, to be repaid by annual instalments spread over a period of 75 years, or such period as may be arranged between the purchaser and the institution. Additional money will be obtained when necessary by the issue of bonds to carry interest at $3\frac{1}{4}$ per cent. or such a rate of interest as would cause them to be taken up whenever issued.

State Purchase.—(8) In view of the experience of the Small Holdings Acts, and the strong desire which undoubtedly exists amongst farmers that they should remain tenants, it is probable that no large percentage will desire, or be in a position to avail themselves of, a scheme of State-aided purchase, and in these circumtances the Committee are of opinion that landed estates should be purchased and managed by the State, the farmers in this case being the tenants of the State.

In regard to the scheme of State-aided purchase (see recommendation (7) above), Mr. Parker states that he is entirely opposed to the recommendation, and Mr. Trustam Eve recommends in the place of Sir Edward Holden's scheme that legislation should be introduced at an early date to enable tenants to purchase their holdings by voluntary methods, from their landlords, by means of reducible mortgages, to be arranged by the State on the following plan :—

(1) The scheme to be confined to :—(*a*) Sitting tenants. (*b*) The son of a sitting tenant on nomination of the latter.

(2) The amount of the purchase money to be voluntarily agreed upon between the owner and sitting tenant.

(3) The State to advance the whole of the purchase money, which will be paid to the owner.

(4) The State may receive part payment of any amount, at the discretion of the tenant.

(5) The mortgage to be repaid over a period of years, and the interest to be $3\frac{1}{2}$ per cent.

(6) The annual sinking fund to repay the capital to be based on the $3\frac{1}{2}$ per cent. tables, and to vary in direct proportion to the number of years' purchase which fairly applies to the net annual value of the holding.

(7) No advance to be made by the State in respect of any proposed sale and purchase unless the Board of Agriculture certifies that the proposed purchase money is not in excess of the market value of the holding.

Lord Clinton, Mr. Campbell, Mr. Frank, Mr. Abel Smith, and Capt. Weigall dissent from the Committee's recommendation (8) in regard to State purchase, while Sir Charles Rose and Sir Edward Holden express the opinion that it should be limited to the acquisition of land for sitting tenants who are threatened with dispossession.

Mr. Frank and Capt. Weigall disagree with the recommendation (4) as regards the proposed counter notice and Messrs. Ellis Davies, Nicholls, and Parker state that, in their opinion, the tenant should be compensated for any improvement effected by him which has increased the letting value of the farm as an agricultural holding.

Jerusalem Artichokes as a Food for Stock.

The Board recently received an inquiry as to the food value of Jerusalem artichokes (*Helianthus tuberosus*) for cows in milk, and information relative to their value for live stock generally may prove of value to readers of this *Journal*.

Artichokes may usefully be given to cattle, horses, sheep, or pigs, and, under certain conditions, may prove sufficiently valuable for cultivation as a food for stock, especially perhaps in the case of pigs, and on poor soils. It occasionally happens that a quantity of artichokes may not be required for human consumption, and they may then be utilised to replace other roots in the ration of farm stock. McConnell says that the stems are sometimes cut while young for forage.

Value as a Food for Cattle.—Shaw * states that for cattle-feeding artichokes have much the same value as potatoes, and that they may be given in about the same quantities. He adds, "it is not probable, however, that they will ever be much grown as food for cattle because of the labour required in handling them for winter feeding, when they are more valuable relatively than at other seasons. They furnish good food for calves, for store cattle in winter, and for cows in milk, also for cattle that are being fattened, when they can be spared for such feeding."

It is stated by Kellner† that large quantities cause purging and make the milk watery.

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* Thos. Shaw, *Feeding Farm Animals*, 1907, p. 336.

† O. Kellner, *The Scientific Feeding of Animals*, translated by W. Goodwin, 1909, p. 180.

Value as a Food for Pigs.—For the feeding of pigs, Coburn * says that Jerusalem artichokes are estimated as having approximately the same feeding value as potatoes, or a little more. In America the pigs are turned into the field to harvest the crop for themselves, and Coburn states that a crop of artichokes used as pasture should provide for eight or ten hogs per acre for three or four months, the length of time depending on the grain-food given. "Its worth, cost considered, has not been fully appreciated, perhaps because of the prevalent idea that, once established in the soil, its eradication is very difficult; but this is not necessarily a fact. . . . In the fall, when the tubers are grown, the hogs will do the harvesting." At the Missouri Agricultural College it was found that for pig-feeding one bushel of artichokes and three bushels of maize were superior to four bushels of maize.

In Bulletin 129, issued by the Ontario Agricultural College, it is stated that in some districts of Canada the crop is very popular as a food for pigs, that pigs are very fond of artichokes, and that the tubers have a little higher feeding-value than potatoes. At the Canadian Central Experimental Farm † one-sixteenth of an acre of artichokes was found to return a net profit in pork of $9.76 (40*s.* 6*d.*). The pigs received a grain ration of 1½ lb. per head per day of meal composed of one-half maize, and one-sixth each of oats, peas, and barley, and harvested the artichokes while still immature. The average gains of six pigs were as follows:—

Average weight, October 3rd	104 lb.	Average gain	33 lb.
,, ,, ,, 24th	137 ,,	,, Daily rate of gain	1·57 lb.

Potts ‡ says: "Few foods are more relished by pigs. The tuber in the raw state is very nutritious, more especially for pregnant sows, and also sows reduced in weight and condition after suckling and weaning big litters. . . . One acre will support twenty sows from four to six months."

At the Oregon Experiment Station ** six pigs were fed with grain, on one-eighth of an acre of artichokes, between October 22nd and December 11th. The pigs weighed from 117 to 215 lb., and consumed 3·1 lb. of grain for each pound of gain in live-weight, and as 5 lb. of grain alone is usually

* F. D. Coburn, *Swine in America*, 1909, pp. 168, 255.
† *Ann. Rept. of Exp. Farms*, 1900–1901, p. 94.
‡ H. W. Potts, "Feeding of Pigs," *Agric. Gaz. of N.S. Wales*, 1909, p. 276.
** U.S. Dept. of Agric., *Farmers' Bulletin*, No. 92, p. 20.

consumed per 1 lb. gain in live-weight, the artichokes saved nearly 2 lb. of grain for each pound of gain. According to the *Farmers' Cyclopædia of Agriculture* (1904), some trouble is occasionally experienced in getting pigs to eat the raw tubers.

Coburn remarks that the tops are seldom, if ever, eaten by pigs, but are considered excellent fodder for horses and cattle. He further says that the better health of pigs resulting from the addition to the ration of this fresh and succulent food is a matter of great importance, especially in animals which are kept for breeding. Throughout the experiment at the Oregon station the animals were noticed to be healthy and vigorous. Shaw suggests that the harvesting of the tubers is especially useful for brood sows, owing to the exercise necessarily obtained in the labour of rooting them out.

Value as a Food for Sheep.—For sheep, Shaw says that "store sheep and breeding flocks will be much benefited from supplementing the other dry food fed with 2 or 3 lb. of artichokes per day." Ordinary roots, however, are less costly to handle for sheep-feeding. In Australia the stalks are frequently used for feeding sheep or conversion into silage (Potts).

Value as a Food for Horses.—In regard to horses, Shaw says that tests have shown that artichokes are an excellent food, and have been given to the extent of making a reduction of 50 per cent. in the hay required, with results that were satisfactory. Magen found that the peasants in Southern France give artichokes to work-horses, and himself obtained satisfactory results with draft animals.* His opinion was that not over 12 litres ($\frac{1}{3}$ bushel) of chopped tubers should be given daily, and he mixed them with crushed grain and 10 to 15 litres (say $\frac{1}{4}$ to $\frac{1}{2}$ bushel) of chopped hay. He found that when thus substituted for barley or oats for a hundred days no unfavourable results were noted. This ration is recommended as being very economical, both on account of the small value of the land on which the artichokes are cultivated and the ease with which the plant may be grown.

Artichokes may be given whole to all four classes of stock, but may usefully be sliced or pulped for cattle, sheep, and horses. They may be given raw or boiled. Stock do not

* *Exp. Sta. Record*, xviii. 1906–7, p. 764.

always take to them readily, but appear soon to relish them. Wolff says* that they are only occasionally employed as a farm food, while Kellner writes to the same effect. Sheep eagerly eat the leaves and tender parts of the luxuriant upper-growth.

Composition of Artichokes.—According to Wolff, the tubers contain more water and more albuminoids than potatoes, while they appear to contain as large a proportion of amides to albuminoids as turnips, and some determinations of amide nitrogen at Hohenheim gave results amounting to more than 40 per cent. of that of the albuminoids.

Kellner says that "the tubers of artichokes are closely allied to potatoes in composition, but instead of starch they contain other carbohydrates—lævulin and inulin—and slightly more water."

Potts gives the following average composition of artichokes compared with potatoes:—

	Water.	Ash.	Protein.	Carbohydrates.	Fat.	Nutritive Ratio.
Artichokes ...	79·5	1·0	2·5	16·7	0·2	1 : 7
Potatoes ...	78·9	1·0	2·1	17·9	0·1	1 : 8·6

Behrend's experiments † showed that artichokes contained about as much dry matter (16·07 to 25 per cent.) as sugar beets, and rather more water than the best types of potatoes. Raw protein varied between 3·31 and 10·73 per cent. of the dry matter—rather more than in sugar beets, but below that in potatoes; the proportion of fibre approximated to that in potatoes, while, as in other tubers and roots, the fat content was very small. The proportion of the dry matter soluble in water was very high—80 to 90 per cent.—and from this Behrend argued a high digestibility of the tubers, and thought that this might account for the good results obtained in the feeding experiments conducted with artichokes. Tubers stored for three or four months in a cool cellar, from spring to August, were found to keep well, though they dried somewhat, and were consequently richer in dry matter.

Cultivation of Artichokes.—Artichokes grow to best advan-

* E. V. Wolff, *Farm Foods*, translated by H. H. Cousins, 1895, p. 210.

† *Zeitschrift für Spiritusindustrie*, 9 June, 1904, as abstracted in *Bulletin Mensuel*, 1904, II., p. 922; also *Journal für Landwirtschaft*, 1904, p. 127.

tage on good, well-drained loamy soils such as are most suitable for potatoes; they will, however, give very fair yields on the poorer sandy soils, on gravels, and on peaty soils, but are not so suitable for heavy land. They respond at once to manuring and cultivation. They are very hardy to frost, and will give fair yields several years in succession on the same ground. For all these reasons artichokes may usefully be planted on odd or waste patches of land on the farm, and may be continued from year to year by leaving a few tubers in the soil. In Wilson's *Farmer's Dictionary* it is stated that the plant grows well under shade, "it can be cultivated in woods and half-waste grounds; it is sometimes planted in English woods, and left to propagate itself, in order to afford shelter to game; and it might very advantageously be raised on semi-barren or exhausted soils as food for stock." The American *Farmer's Cyclopædia of Agriculture* (1904) states that the plant will thrive and produce abundantly on light sandy or gravelly soils, too poor for many other crops, the main requirement appearing to be a dry soil. If the soil is wet the tubers rot. The plant is resistent to drought, and as a rule remarkably free from insect or fungus pests. The stems grow very tall (up to 10 ft. in height) and the foliage is plentiful, and the dense shade during the summer months tends to the suppression of all weeds on the ground occupied by the crop.

In planting artichokes the land may be ploughed and ridged as for potatoes, manuring in the same way if desired, planting the tubers 18 in. apart in the rows, with 30 in. to 36 in. between the rows. From 12 to 15 cwt. of tubers per acre are necessary. When once established, planting every year is unnecessary, as the small tubers left when the crop is raised will produce a sufficient number of plants. Planting may take place in autumn or spring. The best and most shapely sets should be planted, particularly when intended for human consumption. Hoeing should be continued until the plants are 2 ft. to 3 ft. high. The crop of tubers may be utilised from October onwards, but they are generally left in the ground until spring and dug up as required. Frost does not injure the tubers if they are allowed to thaw in the ground. The yield of tubers at the Oregon Experiment Station was 740

bushels per acre (or, at 45 lb. per bushel, no less than about 15 tons), and is given by Potts as averaging 7 to 8 tons, the white and pink varieties when tested having yielded 9 tons 1 cwt and 6 tons 16 cwt. respectively. McConnell gives the produce as 3 to 8 tons per acre, and, as a rule, the weight of crop obtained is probably less than that of potatoes on similar soil. In Wilson's *Farmer's Dictionary* already referred to, it is stated that, "In Alsace, Jerusalem artichokes are always grown, without any rotation, and with manure only every second year, upon the same land. At Bechelbronn, upon somewhat shallow soil, they produce per acre 10 tons of tubers and 11½ cwt. of dried stems; and in many situations, upon land of medium quality, and without any manure, they produce per acre about 500 bushels of tubers. The leaves and stems are used on the Continent as both green and dry fodder." According to the American *Farmer's Cyclopædia of Agriculture* (1904) the yield varies from 275 to 1,000 bushels per acre.

Night Frosts in Spring.

THE various means by which fruit trees may be protected against late spring frosts have from time to time been dealt with in this *Journal*,* and it may at this season be useful to call attention to some notes on the subject of night frosts in spring prepared for issue by the Meteorological Office two or three years ago. The notes have been embodied in a chapter on the subject in *Forecasting Weather*, by the Director of the Meteorological Office (Constable & Co., Ltd.).

Causes of destructive Frosts in Spring.—Destructive frosts in spring may arise from three separate causes: (1) the occurrence of the ordinary type of cold, wintry weather which is not uncommon in spring, there being a northerly, north-easterly, or easterly wind, indicating a cold spell, probably with snow. (2) Changeable April weather, which can be referred to the passage of barometric depressions: if the baro-

* Previous notes on the subject have appeared in the *Journal* as follows: April, 1906, p. 57; June, 1906, p. 184; Sept. 1906, p. 375; April, 1907, p. 23; Oct. 1908, p. 521; March, 1910, p. 1024; Oct. 1910, p. 558.

meter and wind are watched, it will be noticed that after rain, with a falling barometer and a southerly or south-westerly wind, the wind veers to the west, north-west, or north, and becomes apparently drier, and the weather clears and becomes cold. If this change occurs towards evening, and the wind drops when the sky clears, a frosty night is almost certain. (3) The third recognised cause refers especially to night frosts, which may occur with destructive effect if the night is clear, even after a warm sunny day, and the destruction is more complete if the day which follows the cold night is itself sunny and warm. The most destructive frosts occur when the causes here noted as the second and third combine, when cold, clear weather, with a calm night, follows a boisterous day, with a veering of the wind to the north-west or north.

During clear weather the day temperature is increased by the warm sunshine, but the night temperature is lowered. After the sun is gone, and when the earth and its covering herbage are exposed to a clear sky, they lose heat and get colder than the air. They may cover themselves with dew or hoar frost, this being a sure sign of their having been cold. In turn they cool the air next to them, and the cooled air in its turn trickles like water downhill to the valleys.

In these circumstances the plants on the tops of the hills are fortunate, for the air which replaces that which has been cooled and has trickled away is practically part of the original undisturbed supply and is comparatively warm. The plants on the hillside get the air which trickles down from above, and which is consequently colder than that enjoyed by the plants at the top. The cooling goes on as the air flows down to the valleys. But the worst fate awaits the plants in the valleys, where pools of cold air form. Thither the coldest air gravitates, and for the plants at the bottom the air is stagnant; consequently they may cool by exposure to the open sky.

The effects of this process of cooling may be very different in situations which are quite near to one another. Meteorologists are accustomed to note such effects by having one thermometer "on the grass," supported on a couple of forked twigs close to the ground, and another "in the screen," which means that it is kept in a louvred box at a height of four feet from the ground. On calm, clear nights the effect of the

protection of the screen is very striking. The differences are not altogether due to enclosure in a screen; the height of the screen above the ground has something to do with it, because the trickling stream of cold air keeps to the ground, and is often not very thick.

Distribution of Temperature during Night Frosts.—The following conclusions regarding the distribution of temperature during frosts on calm nights are well established:—

(*a*) The frost becomes more severe as one goes from the hills down to the valleys. Hollows on the hillsides are colder than the more exposed parts.

(*b*) The frost is most severe at the ground, and becomes less severe at shrub height, still less so at tree height, so that herbage and low shrubs may be destroyed when higher shrubs and trees are spared.

(*c*) An overcast sky or a light wind generally prevents ground frosts.

It is also a well-established meteorological fact that, on the average, wind falls off in the evening, and in settled weather a calm night often follows a day with a good breeze. This is especially the case with an easterly wind.

Forecasts of Spring Frosts.—Referring to the three causes described above, the first two are easily associated with general meteorological conditions over the country, and to anticipate them forms part of the ordinary duty of weather forecasting. The changes are often very sudden, and while it is, as a rule, possible to anticipate their general character, it is less easy to form an estimate of the intensity of the changes. The difference between the changes which produce only a chill and those which cause a frost is not indicated on the maps used for forecasting.

The frosts of calm nights are still more difficult to deal with by forecasts issued from a central office. They are subject to the effects of local peculiarities of site and circumstances of which account can only be taken by those who are on the spot. A light air, hardly strong enough to be called a wind, will keep away a night frost by preventing stagnation; a calm, on the other hand, favours frost, but from the point of view of the weather forecaster the calm may be an artificial calm due to surrounding trees or buildings, and not at all due to what he would understand by the weather.

It has already been pointed out that situation, whether on a hill or hillside, or a valley, is also of importance. It is, therefore, necessary that persons interested in protecting their crops from frost should make use of their local knowledge in extension of the information to be obtained from forecasts.

One of the best aids to the use of local knowledge is the regular study of weather maps. The Meteorological Office issues daily charts of the weather over the British Isles and North-western Europe, which can be had by anyone on payment of the cost of postage and covers (£1 per annum), and the conditions for the occurrence of frosts can be watched much more effectively by an examination of the daily map than by the mere consultation of the forecast which is drawn up for a whole district and must be limited to about a dozen words.

Further information about the probability of a night frost may be got from local observations of the temperature and humidity of the air. From readings of the dry and wet bulb thermometer on any occasion, the so-called "dew point" of the air can be computed. The dew point is the temperature at which dew begins to form.

It has been supposed that on a calm night the air cannot be cooled far below the temperature of the dew point of the previous evening, but this is not the case. All we can say is that the loss of heat is checked when the temperature falls to that of the dew point. The following cases combine to bring about this result:—(*a*) While the temperature is above the dew point evaporation is proceeding from the ground and from herbage, and causes a loss of heat from them in addition to that due to exposure. Below the dew point this additional loss of heat does not occur. (*b*) If exposed surfaces are cooled below the dew point, moisture condenses on them in the form of dew (or hoar frost), and in the process a certain amount of heat is liberated from the condensed moisture, which in part balances the loss of heat due to exposure. (*c*) The cooling of the air may result in the formation of mist which, acting as a screen, checks a further fall of temperature. Destructive frosts on calm nights are thus more likely when the air is dry, that is, when the dew point is far below the air temperature, or the wet bulb is far below the dry, than on nights when

it is moist or the dew point and wet bulb temperatures are near the dry.

Practical Hints in Forecasting Frosts.—From what has been said above, it will be gathered that anyone who is interested in protecting his crops from night frosts, and, therefore, wishes to know beforehand when frosts are likely to occur, will do well to study:—

(1) The peculiarities of his locality to know whether from being in a cup or valley it is specially liable to frosts on calm nights.

(2) The daily charts, with or without forecasts by telegraph, in order that he may recognise the meteorological conditions in which the weather is likely to become cold and calm.

(3) The readings of the dry and wet bulb thermometers so that he may recognise the occasions when ground night frosts are likely to be severe on account of the dryness of the air.

*Protection against expected Frosts.**—The best method of protection for young plants against night frosts is to cover them up and thereby prevent first of all the loss of heat, and secondly the access of cold air.

Other means of protection have been tried. Saturation of the ground in which the plants are growing with water is resorted to in fruit plantations in California. Possibly the evaporation of the water is in itself a protection, as it promotes the formation of a mist over the land to be protected, but the warmth of the water itself no doubt also acts to prevent the air just above it being cooled as much as it would have been if the ground had been dry. On the other hand, Continental writers point out that delicate plants are more sensitive to the effects of frost when their cells are fully charged with water than when they are in a dry condition, and the adoption of this method, though mitigating the intensity of frost, may therefore lead to increased damage to the crop. Possibly differences in the character of the crops to be protected, more particularly the heights of the sensitive parts above the ground, may account for the apparent differ-

* For an account of methods other than those mentioned in these Meteorological Office Notes, see the previous numbers of the *Journal* already referred to.

ence of opinion. On occasions when there is an appreciable breeze, saturation of the ground is probably harmful, as it would promote increased evaporation, and so lead to cooling, while the protecting mist would be dispersed by the breeze as rapidly as it was formed.

Vegetation suffers most when the plants are rapidly warmed by the sun after being exposed to frost, so that protection is useful in the early morning when the sun is rising.

The Packing of Butter for the South Wales Markets.

THE Board of Agriculture and Fisheries desire to call the attention of farmers and others supplying butter to the markets of South Wales to the following resolutions as to the packing of butter which have been generally adopted by the Grocers' Associations of South Wales principally concerned in the trade in farmers' butter.

1. That the present practice of packing Welsh butter in old boxes of various shapes and sizes prevents Welsh butter from obtaining the price in the markets of South Wales to which it is otherwise entitled, and is detrimental to the interests of makers of, and also of those who deal in, Welsh butter.

2. That the members of the Grocers' Associations of South Wales should require Welsh butter, purchased by them, to be packed as follows:—

3. All butter consigned to grocers and provision dealers in South Wales and Monmouthshire by Welsh farmers should be sent only in tubs or casks of the traditional shape.

4. No butter should be consigned in a tub or cask used previously for any purpose whatever.

5. The tubs or casks should be of 40, 50 and 70 lb. capacity, the wood being well-seasoned white wood, planed smooth, free from knots and all defects and from odour and resin, the edges being either planed or cut with a fine saw.

6. The staves should be about 7/16 in. thick, and each tub should be bound with three galvanised iron hoops or rods, which are recommended as being practically proof against rust caused by brine.

7. Before being packed with the butter the tubs or casks should be steamed or thoroughly scalded with boiling water and afterwards allowed to cool. They should then be carefully lined with parchment paper of the best quality. This paper should be neatly rolled and placed in scalding brine the night before it is used, and allowed to remain in the brine until next morning, when it will be cold and ready for use.

8. In filling up the casks small quantities only should be put in at a time, and the butter should be made firm and solid by being well pressed with a heavy wooden packer from the centre outwards, so as to exclude all the air.

9. At the top of the tubs no space should be left, and the butter should be covered with parchment paper and also a piece of muslin.

10. In nailing the lids care should be taken that the nails do not protrude inwards, as otherwise the butter is liable to be damaged when it is turned out.

11. To prevent the packages becoming dirty in transit and also to preserve the butter in hot weather, the casks should be wrapped in canvas covers.

12. In order to distinguish Welsh butter from other kinds it would be an advantage that the tubs or casks should be branded by means of an inexpensive printing brand with the words, in English, "Welsh butter."

Helianthi as a Food for Stock.

A new fodder plant, a cultivated form of the plant *Helianthus macrophyllus,* has been sold during the last three or four years under the name of "Helianthi," "Helianti," or "Salsefis." It is a perennial species of Helianthus, allied to the sunflower and Jerusalem artichoke, but produces tubers that differ from those of the Jerusalem artichokes in being slender and spindle-shaped. The plant is remarkable for its enormous production of tubers and generally luxuriant growth. The stems above ground grow as high as 9 or 10 feet, and may be used as fodder, either green or as hay or silage. If the crop is not cut for fodder the growth matures and then dies back, while a heavy crop of tubers is produced, which may be fed to horses,

cattle, pigs, or sheep. They are also said to be superior to Jerusalem artichokes for culinary purposes. Up to the present no report of trials of the plant as a field crop in this country is available, but an article in the *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft* (October 28th, 1911) calls attention to the value of the Helianthi as forage plants.

According to analyses made by Professor Dr. Küster of Müncheberg, the composition of the green fodder is as follows:—Water, 68·0 per cent., protein 3·5 per cent., fat 1·0 per cent., carbohydrates 17·5 per cent., while the dried leaves contain protein 13 per cent., fat 2 per cent., and carbohydrates 48 per cent. These figures show greater feeding values than either clover or lucerne, assuming that all are similar as regards digestibility and suitability for stock, the composition of the latter being as follows:—

	Clover (green). Per cent.	Clover (hay). Per cent.	Lucerne (hay). Per cent.
Protein	3·3	12·3	14·4
Fat	0·7	2·2	2·5
Carbohydrates ...	7·0	33·2	28·0

The tubers of the plant contain a substance (inulin) akin to starch, which is of value for feeding purposes, and they are also quite palatable and suitable for use as a vegetable.

No special soil or situation is apparently needed for the cultivation of the plant, but it is preferable that land which can be permanently assigned to the crop should be selected, owing to the difficulty of eradicating the plants. As a rule, the plant is not propagated by seeds but by tubers, as in the case of potatoes. If left to grow undisturbed, a thick bush is in time formed.

SUMMARY OF AGRICULTURAL EXPERIMENTS.*

SOILS AND MANURING.

Sewage Sickness in Soil and its Treatment by Partial Sterilisation. *Dr. E. J. Russell and Mr. J. Golding.* (*Jour. Soc. Chem. Indust., April 29th,* 1911).—The method known as the land purification of sewage consists in allowing the sewage to drain through soil which retains most of the fertilising material. By the agency of bacteria this decomposes, and is utilised by crops grown on the land, giving some financial return for the treatment. The system, however, has the serious disadvantage that the soil gradually becomes "sewage sick," in which state its efficiency as a filter is low, and the effluent consequently impure.

A soil in such a condition has to be rested for a longer or shorter period, in which time no sewage can be run on it.

To some extent this "sickness" is due to physical causes. Owing to the continuously wet condition of the soil receiving sewage, the clay—of which there is some in even the lightest soils—gradually becomes deflocculated or more gluey in its consistency. Drainage is retarded, and the amount of air in the soil is too little to meet the requirements of the bacteria which bring about the decomposition of the organic matter.

The authors, however, show that the bacteria, and consequently the decomposition, are affected in another way.

The fact has been established that even in an ordinary soil there is some factor that keeps down the number of useful decomposition bacteria, and the experiments of Russell and Hutchinson indicate that this factor consists of larger organisms, probably protozoa.

These larger organisms are more readily killed than are bacteria; by heating the soil or treating it with antiseptics they may be completely destroyed, while many of the useful bacteria survive, and afterwards develop at a very rapid rate, with consequent rapid liberation of available plant food and improved growth of crops.

From their experiments, carried out at the Kegworth Sewage Farm, the writers conclude that one of the causes of sewage sickness is the great increase in the number of the injurious organisms, owing to the specially favourable condition of a soil treated with sewage. When soil from the farm was partially sterilised by heating, or by treatment with toluol or carbon disulphide, the number of bacteria after a short time rose greatly (in some cases to more than ten times that observed in untreated soils), with correspondingly rapid decomposition of organic matter in the soil, and recovery from sewage sickness. Analysis of the effluents showed that treated soils were more effective as filters, and did not so quickly lose their efficiency.

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* A summary of all reports on agricultural experiments and investigations recently received is given each month. The Board are anxious to obtain for inclusion copies of reports on inquiries, whether carried out by agricultural colleges, societies, or private persons.

The writers suggest that it may be possible to apply the method on a large scale either by adopting the old agricultural practice of "paring and burning," or by the injection of cheap volatile antiseptics into the soil with suitable mechanical apparatus.

Renovation of Poor Pasture Land (*Lancs. C.C. Educ Com., Agric. Dept., Farmers' Bulletin No.* 22).—This experiment was commenced at four centres in the county of Lancaster in 1906. Five half-acre plots were chosen at each centre, the plots receiving the following dressings per acre :—1½ tons cob lime, 1 ton ground lime, 10 cwt. basic slag, 5 cwt. superphosphate + 7 cwt. ground lime, and 5½ cwt. boiled bones. Half of each plot received an additional dressing of 4 cwt. per acre of kainit. In January, 1908, a further application of the same manures was given to each plot. As a subsidiary part of the scheme of renovation, a strip of land on each side of the central line dividing the two halves of each plot was sown in April, 1906, with white clover seed, though the seeds were neither harrowed in nor covered with soil. In addition to the preceding group of centres, further plots were subsequently laid down at two other centres. At the first of these, plots were manured as above described, a sixth plot being added which received 5 cwt. superphosphate and 10 cwt. ground limestone. At this centre the white clover seed was covered with soil on part of each plot. At the remaining centre no clover was sown; in each case the dressings of ground lime were replaced by increased quantities of ground limestone.

No precise information was obtained during the experiment as to the financial advantages resulting from the treatment, as the plots were not fenced off, and stock grazed over the fields at will. A detailed account is therefore given in the report under notice of the improvements which were observed at each centre separately, and the authors of the report, Dr. T. Milburn and Mr. R. C. Gaut, draw the following conclusions from the results of the experiment as a whole :—

(1) Much of the poor pasture land in Lancashire which, although doubtless satisfactorily under-drained, is covered by inferior grasses, is capable of being not only improved, but converted into good sound grazing land.

(2) The method of improvement adopted need not necessarily be a costly one, the most important question being to decide as to the kind of material it is essential to employ.

(3) There are reasons for believing that the second dressing given in 1908 to the plots at the four centres, where the trials were commenced in 1906, was unnecessary.

(4) Lime gave decidedly satisfactory results at one centre only. As a rule, whether the dressing used was one of cob lime, ground lime, or ground limestone, it effected only a slow change in the character of the original herbage.

(5) Phosphatic manures proved the most effective agents in improving the value of the pasture, and gave, on the whole, excellent results.

(6) All the phosphatic dressings used (basic slag, super-lime, boiled bones) did uniformly well, and there was practically nothing in the results at the different centres to show that one was superior to another.

(7) Potash, added to either a dressing of phosphates or lime, did not effect any marked improvement, though its effect upon the

feeding value of the herbage remains an undetermined factor which must not be overlooked. It is extremely doubtful whether in this experiment, kainit was profitably employed, though it should be remembered (and also when reading No. 6 conclusion) that no trial was carried out on typically light land.

(8) The effects of the dressings, even where they were applied several seasons ago, are not yet exhausted.

(9) Several factors affect the speed at which improvement is brought about, among the most prominent being :—

(*a*) The character of the season that follows the application of the manures.

(*b*) The attention which is paid to grazing the herbage.

(10) At one centre, where the pasture was covered with a stubborn herbage composed mainly of mat-grass and sheep's fescue, none of the dressings effected any material change.

(11) Sowing seed of white Dutch clover as a means of bringing about a speedy improvement in a poor pasture was not justified.

In an appendix to the report, the results of a test on ordinary arable land with wild white clover are described. When sown in a seeds mixture it proved much more permanent than the ordinary cultivated variety of white clover.

Manuring of Grass Land (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xi–ii, 1910).—Plots were laid down at nine centres in Oxfordshire in 1909, to test the effect of various manures and combinations of manures on grass land. In most cases the grass was mown in 1910, and the bulletin gives particulars of the weights of hay obtained in that year, together with notes on the character and quality of the herbage on the different plots at each centre. The experiment is being continued, but from even two years' results it is clear that the manure or the mixture of manures which is likely to answer best at one centre is not necessarily the best at another centre. A dressing of a phosphatic manure gave profitable returns at most centres, and the addition of potash and nitrogen further increased the yield.

Manuring of Grass Land (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xiii., 1910).—The scheme of manuring in this experiment is the same as that in the one mentioned above. Plots have been laid down at eighteen centres in Bucks, five years' results having been obtained from two centres, and four years' results from eight centres. Full particulars of the weights of hay obtained up to the present, together with analysis of the soil at each centre, are given in the bulletin.

Manuring of Poor Hill Pastures (*Somerset C.C., Report of the Agric. Instr. Com. for the period ending March 31st,* 1911).—Experiments to test the effect of basic slag, superphosphate, lime, and kainit are being carried out at four centres in Somerset. A distinct improvement is noticeable on the plots receiving slag and superphosphate. So far the ground lime and kainit have given little or no result.

Manuring of Meadow Land (*Monmouthshire Educ. Com., Rept. of Director of Agric. Educ., October 18th,* 1911).—This report gives the results of trials with artificial manures carried out on three different soils since 1909.

Manuring of Hops (*Rept.*, 1911, *by Dr. Bernard Dyer*).—These experiments deal chiefly with the use of nitrate of soda for hops. The land, at Hadlow, Tonbridge, is old hop ground, replanted in 1894, and the hops are "Fuggles." In 1895 all the plots were limed and dunged, but no more dung has been given except on the continuously dunged plot. Phosphates and potash have been used each year, 8–10 cwt. of superphosphate and basic slag in alternate years, and 2 cwt. of sulphate of potash. The nitrate of soda has been applied on different plots in quantities from 2 cwt. to 10 cwt. per acre, usually in dressings of 2 cwt. per acre at about monthly intervals from January to May. The principal results, taking the average crop in the sixteen years, 1896–1911, are as follows (per acre):—

Manuring.	Average Crop. Cwt.
Phosphate and potash	10½
,, ,, and 2 cwt. nitrate of soda	13½
,, ,, and 4 cwt. ,, ...	15½
Thirty loads (15 tons) London dung	14¾

Applications of greater quantities than 4 cwt. of nitrate of soda have given very slight increases of crop for the extra quantity. Samples from each plot have been submitted to chemical analysis for determination of the resins and estimation of the value of the hops, and to merchants and factors in the Borough, and no difference has been found between the hops grown with chemical manures and those grown with dung. Dr. Dyer concludes that even when the soil is liberally manured by autumn or winter dressings of dung, rape dust, fish guano, &c., 4 cwt. per acre of nitrate of soda applied early in the spring may be regarded as a safe and profitable dressing for hops, even in a wet season, phosphates being used liberally at the same time, and also potash salts if the land requires potash.

Manuring of Swedes (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull. x.*, 1910).—The results of experiments carried out at five centres in Oxfordshire in 1910 are given. Superphosphate, steamed bone flour, and basic slag were compared with one another, both singly and in combination with sulphate of potash and sulphate of ammonia (except in the case of basic slag, when the sulphate of ammonia was replaced by nitrate of soda). The results obtained at the different centres varied a good deal, the deciding factor evidently being the amount of lime in the soil. Where a sufficient quantity of lime was present, superphosphate gave the most profitable results. With soil deficient in lime, slag gave better results. Compared with the other manures, steamed bone flour proved a failure. The addition of a nitrogenous or potassic manure to the phosphate in most cases increased the crop, but not always to such an extent as to make the addition profitable. It is, however, pointed out that in most cases the land was in good condition, and on poorer soil the application of the other manures, in addition to the phosphates, might have given more profitable returns.

Dry Farming in Hungary (*Internat. Inst. of Agric., Rapport sur le Dry-Farming système Campbell*, 1911, p. 52).—A paper in this publication describes the results of a trial of the Campbell system of cultivation at Debreczen, in Hungary, on the conservation of water in the soil.

The rainfall during the twelve months from September, 1909, to August, 1910, amounted to 22½ inches. The trial started in the autumn of 1909, when a plot of rye stubble was left untouched for comparison with other plots which were disc-cultivated and ploughed in autumn, and cultivated and harrowed in the following spring. The amount of water in the soil of the two plots was determined at intervals, and was considerably greater in the case of the cultivated land. On May 6th, about the time when tobacco was planted, the cultivated soil contained 15 per cent. of water at a depth of 24 in., and 14 per cent. at 39 in., while the uncultivated soil contained 10 per cent. and 7 per cent. respectively. On June 28th, after the tobacco had been using the soil moisture for six weeks, the content of water was 13 per cent. at 24 in., and 12 per cent. at 39 in., but in the uncultivated soil it was only 5 per cent. at 24 in., and 4 per cent. at 39 in.

Trials with the Campbell soil-packer were carried out in 1910, after the usual thorough ploughing and cultivation of the "dry-farming" system, with uniformly favourable results on cereals, potatoes, and forage crops.

FIELD CROPS.

The Growth of Sugar Beet (*Somerset C.C., Report of Agric. Instr. Com. for the period ending March 31st,* 1911).—Sugar beet was sown at six centres in Somerset in 1910 alongside mangolds, the two crops receiving exactly the same treatment except that the beet was left closer in the drills. The average weight of beet was 16 tons per acre, as compared with 40 tons of mangolds per acre. The composition of the sugar beet at the different centres is given, and the conclusion is drawn that heavy manurial dressings tend to depress the percentage of sugar in the beet. The average amount of sugar in the roots was 16 per cent.

Effect of Soil and Climatic Conditions on the Composition of Wheat (*Univ. of California, Agric. Expt. Sta., Bull.* 216).—The writers of this Bulletin point out that there is a wide difference of opinion as to the factors which influence the composition of wheat. Generally speaking, variety, climate, and soil are regarded as the most important, though different investigators place different values on each. The experiments of which an account is given in this Bulletin were designed to throw light on the question.

In a series of preliminary trials the following conclusions were arrived at:—

1. Wheats of the same variety when grown in the same locality and under the same conditions vary but little in composition, even though the seed differs widely in physical and chemical characteristics.

2. Wheat of the same variety and absolutely uniform in other respects, if sown in different localities with different climatic conditions yields crops of widely different appearance and chemical composition.

3. Soil and seed [this apparently does not refer to variety but to general character] appear to play a very small part in influencing the composition of wheat.

These all suggest that climate is the principal factor affecting the nitrogen content of wheat.

In order to test further the effect of soil on the nitrogen content

of wheat, soils of widely different types were obtained, and small plots made with them at the experiment station, thus eliminating the influence of climate. The experiment has been carried on for three years, and two varieties, one a "high protein" wheat, the other a "low protein" one, have been tried.

Analyses of the soils and crops are given. From the results it seems quite certain that the soil nitrogen has very little, if any, direct influence upon the nitrogen content of grain grown upon such soil, and that some climatic factor is sufficient to overshadow the soil factor entirely. Further, it appears that the nitrogen content of an original seed, when grown elsewhere than in a climate to which it has been acclimatised, has little or no influence upon its progeny. For instance, the original seed which had been produced on Kansas soil in Kansas, and which contained 3·04 per cent. of nitrogen, when grown on Kansas soil in California produced wheat containing only 1·91 per cent. of nitrogen.

In an addendum dealing with the 1911 crops, the conclusion is again emphasised that "the climatic factor is the chief one in producing changes in the chemical composition of wheat."

Varieties of Wheat (*Somserset C.C., Report of Agric. Instr. Com. for the period ending March 31st,* 1911).—A test with several varieties of wheat was carried out at one centre in 1910, with the special object of comparing some of the new French wheats with older varieties. The wheats were sown in November, but the French varieties failed to come up, and had to be resown in spring. Notes on the quality of the different samples of grain are given, in addition to the weights of grain and straw per acre.

Milling and Baking Tests with Wheat (*Kansas Agric. Coll. Expt. Sta., Bull.* 177).—This Bulletin describes at great length attempts to trace the connection between the chemical composition of wheats and flours, and their milling and baking qualities. Much attention has been given to the control of the milling and baking tests so as to improve them in regard to the uniformity of their results.

The work done shows that baking results are influenced very greatly by a large number of details, such as variation in the amount of water or yeast used, differences in the extent of the rising, in the working of the dough, in the fineness of the flour, in the initial temperature of baking, &c.

Detailed analyses of about sixty wheats, with the results of milling and baking tests, are given.

Heating of Hay Stacks (*Arb. der Deut. Landw. Gesell., Heft* 196).—Investigations which have been carried on on the Continent with regard to the heating of hay stacks seem to have resulted in some differences of opinion as to the nature and cause of the changes that take place. This publication contains an account of experiments carried out by Dr. Hugo Miehe at the Botanical Institute of the University of Leipzig, and the results are compared with those obtained by previous experimenters.

Dr. Miehe states that it is highly probable, when the grasses are not quite dead, that the first rise in temperature of the hay can be ascribed to the respiration of the living plants which is increased on account of the wound caused by cutting. He found no absolute

proof of this, however, since he was not able to obtain living pieces of grass free from bacteria. The action of the living plant must be restricted to the initial stages of heating, since grass is killed at a temperature of 40° to 45° C., whereas the temperature reached by hay in the stack amounts commonly to 70° to 80° C.

It was found that heating could not take place in the absence of oxygen, but neither was steam-sterilised hay capable of spontaneous heating.

At the same time, a rise in temperature was obtained when a little ordinary hay was added to the sterilised, showing that the presence of micro-organisms is one of the factors necessary for the heating. Further evidence in support of a biological explanation as against a purely chemical one was afforded by the fact that hay moistened with formaldehyde or chloroform quite lost its self-heating capacity. The great absorption of oxygen by the hay at high temperatures and the production of carbon dioxide is taken as a proof of nothing more than that at high temperatures (after self-heating has been accomplished) oxidation takes place, leading to the stack catching fire, and the purely chemical nature of this latter phenomenon would seem to be doubted by no investigators.

Several different bacteria were isolated by Dr. Miehe, the most active of which was *B. calfactor*. This bacillus was found specially active between 40° C. and 70° or 75° C., above which temperature the heating is no longer due to biological conditions. A second bacillus (*B. coli*) was isolated, which caused a rise in temperature in *dead* hay from 18° C. to 42° C. It is not claimed by Dr. Miehe that heating between these temperatures is caused solely by this bacillus, as two other organisms were found able to cause heating, viz., *Oidium lactis* and *Aspergillus niger,* the former causing a rise to 58° C. and the latter to 43° C.

The writer's findings as to the causes of the heating of hay are summarised as follows:—

(1) Up to 40° C. (104° F.) heating is chiefly due to *B. coli,* or if the grass is not quite dead the first stage is caused mainly by respiratory activity.

(2) From 40° C. (104° F.) to 75° C. (167° F.) *B. calfactor* is mainly responsible.

(3) Above 75° C. (167° F.) the heating is purely chemical.

Necessary conditions to heating are the presence of moisture and a supply of oxygen. Bacilli can only develop in moist substances, and a water content of the hay of 25 per cent. was found sufficient to lead to considerable temperatures. The larger the stack, the higher will be the temperature of the interior.

Feeding Value of Varieties of Mangolds (*Univ. Coll., Reading, Dept. of Agric. and Hort., Bull.* xii.).—A comparison was made of Golden Tankard and Prizewinner Yellow Globe mangolds in regard to the total dry matter per acre produced. Both varieties were grown on four farms, and twenty-five average sized roots from each plot were analysed. The percentage of dry matter in Golden Tankards varied at the different centres from 12·75 to 14·15, and in Prizewinner Yellow Globes from 9·90 to 12·40. Thus six tons of Golden Tankard had approximately the same amount of dry matter as seven tons of Prizewinner Yellow

Globe. The weight of crop produced was, however, higher in the case of the Yellow Globe, so that in total dry matter produced per acre Golden Tankard had only a slight advantage. The percentage of sugar in the roots was also found.

WEEDS AND PLANT PESTS.

Growth of Tobacco for Nicotine Extraction (*Wye Jour., No.* 19, 1910).—Within the last few years the value of nicotine as an insecticide has become fully appreciated by growers of fruit and hops, with the result that the price is now almost prohibitive. The experiments described by Mr. Garrad were designed to test the possibility of growing tobacco and extracting nicotine from it in this country. An account of the results obtained in 1910 appeared in this *Journal,* August, 1911, p. 378.

Charlock Spraying (*Univ. Coll. of N. Wales, Bangor, Agric. Dept., Bull.* 1, 1910).—Demonstrations in 1910 were carried out at fourteen centres with solutions of 15, 20 and 25 lb. of copper sulphate in 50 gallons of water, forming 3, 4 and 5 per cent. solutions. These charlock spraying demonstrations are now concluded, having been conducted at about one hundred different centres in various parts of North Wales. They have shown that in the moist climate of the district 4 and 5 per cent. solutions of sulphate of copper, applied at the rate of 50 gallons per acre, practically destroy all the charlock. The 3 per cent. solution has only proved effective when the conditions have been particularly favourable.

A Bacterial Disease of the Potato Plant in Ireland (*G. H. Pethybridge and P. A. Murphy, Proc. Roy. Irish Acad., Vol.* 29, *Sec. B., No.* 1, *February,* 1911).—This paper contains a complete account of the investigation of the disease called Black Stalk-rot, carried out for the Irish Dept. of Agric. by the authors. A shorter report on the work was published in the *Jour. of the Dept. of Agric. and Tech. Instr. for Ireland,* and was summarised in this *Journal,* August, 1911, p. 420.

Observations on Parasitic Fungi causing "Fairy Rings" (*Jour. Econ. Biol., Vol.* 6, *No.* 4, *Oct.,* 1911).—The well-known "Fairy Rings" in grass land may be caused by several different fungi. In this paper Dr. J. S. Bayliss records observations made on the growth of rings formed by *Marasmius oreades,* Fr., and *Clitocybe gigantea,* Sow. Three distinct zones in the ring itself are distinguished, in addition to the disc of poor grass inside the ring—(1) an outer ring of dark green grass; (2) a zone of dead grass; and (3) an inner ring of dark green grass. The outer zone is usually overlooked, perhaps because it is, at the beginning of summer, only an inch or so in width, and by the time it has attained its full width of several inches, the grass of the field generally has deepened in colour, and the contrast is not so marked. The soil under all these three zones was found to be well penetrated with the mycelium of the fungus to a depth of about a foot, though it was most abundant under the ring of dead grass, and it is in this part of the "fairy ring" that the sporophores ("toadstools") appear when conditions are favourable. The soil in the centre of the ring showed no trace of fungus mycelium. Practically all the common pasture grasses, clovers, and weeds were killed by the fungi, though docks and sorrels seemed able to resist the attacks. The ring is constantly growing outward, and what is the outer zone of one year

is the dead zone of the next, and in the following year the dark green inner zone. Measurements of the rates of growth of a few "fairy rings" are given.

Experiments dealing with the question from various points of view were carried on in both the field and the laboratory, and the conclusions arrived at may be summarised as follows :—

The fungi investigated are parasites on grass and pasture plants. They attack the young roots, kill them by means of some toxic secretion, and gradually destroy the whole plant except the steles. The fungi bring about rapid decomposition of humus in the soil, so that the first effect on the grass is a stimulating one, and there can be distinguished a zone of dark green grass outside the dead grass zone, as well as one inside that ring.

Infected soil is very impervious to moisture. This is particularly seen in the dead grass zone, which can only with great difficulty be wetted. This was found to be due to air entangled within the meshes of the mycelium. The fungi secrete some substance toxic to themselves, and are not able to grow on the same soil three years in succession; during the second year the fungus dies off and the grass, gaining the upper hand, flourishes, owing to the increased amount of available nitrogenous food; hence the well-marked ring of dark green luxuriant grass inside the dead-grass zone.

It is suggested that the explanation of the well-known fact that "fairy rings" appear only on poor grass land is that on better land the grass is more vigorous and better able to resist the attacks of the fungus. Attempts to start "fairy rings" on lawns or in fields, either by using sods taken from existing rings or by sowing spores of the fungus, were quite unsuccessful.

A previous note on "Fairy Rings and their Eradication" appeared in this *Journal,* December, 1907, p. 537.

Leaf Spot of Celery (*Jour. Roy. Hort. Soc., October,* 1911).—Mr. F. J. Chittenden describes a destructive parasitic fungus (*Septoria petroselini,* var. *apii* B. and C.) which in 1909 and 1910 attacked celery to a serious extent in many parts of England. Usually the first symptom of the disease is the appearance of small pale spots on the leaves. These are quite unlike the burrows made by the celery fly larva (see Leaflet 35), and on examination with a lens, small, black dots can be seen on them. When the attack is severe, the whole leaf becomes almost olive-green, and soon the foliage wilts and the leaf stalk, which is also attacked, decays. Even when the attack is not sufficiently severe to cause decay, the growth of the plant is interfered with, and the crop diminished. The same fungus also attacks parsley.

Investigation showed that a great many samples of celery seed had the spores of the fungus upon them, and it is suggested that one of the principal ways in which the disease is spread is the use of such seed taken from an affected crop. Where disease makes its appearance the affected plants should be removed and burned, and the remainder sprayed with either freshly-made Bordeaux mixture or with a solution of potassium sulphide (1 oz. to 3 gallons of water) repeating the spraying after an interval of about a fortnight or three weeks, and again if necessary. Where disease has existed in a previous year it would be well to commence spraying early in the season as a safeguard.

Narcissus Fly (*Jour. Roy. Hort. Soc., October,* 1911).—The Narcissus Fly, *Merodon equestris,* Fab., was scheduled in 1910 by the Board under the Destructive Insects and Pests Acts. It has generally been supposed to confine its attacks to the bulbs of narcissus. Mr. F. J. Chittenden, however, reports that in November, 1910, bulbs of Atamasco Lilies (*Habranthus pratensis*), and Scarborough Lilies (*Vallota purpurea*), were sent to the Wisley Laboratory containing grubs which were later proved to be those of the Narcissus Fly. Cases of the fly attacking the bulbs of Lilies and Barbados Lilies (*Hippeastrum*) are also mentioned, and it is concluded that the Narcissus Fly will attack and destroy the bulbs of other plants than the daffodil, and any effort designed for its extermination should take this possibility into consideration.

LIVE STOCK AND FEEDING STUFFS.

Soy Bean Cake for Bullock Fattening (*Edinburgh and E. of Scotland Coll. of Agric., Rept.* xxv.).—These experiments were a continuation of those carried out by the college in 1909–10 with the object of comparing soy bean cake with linseed cake as a supplementary feeding stuff in fattening bullocks. The other food given varied slightly; at the first centre it consisted of 100 lb. turnips, 8 lb. straw, and 4 lb. Bombay cotton cake daily, and at the second, of 100 lb. swedes, 7 lb. oat straw, 2 lb. dried grains, and 3 lb. Bombay cotton cake. At the latter 8 lb. of hay was substituted for the straw in the last month. In both cases either linseed cake or soy bean cake was given at the rate of 2 lb. per day at first, increasing to 5 lb. during the last seven weeks. In the two years together 36 cattle were fed on each food, and the trials show that soy bean cake used as a supplementary feeding-stuff to the extent of 4 or 5 lb. per head daily, is a healthy cattle food, and a satisfactory beef producer. Weight for weight it is not equal to linseed cake, but when its lower price is taken into consideration, it has the advantage.

Pig Feeding Experiments (*West of Scotland Coll. of Agric., Bull. No.* 57).—During the years 1905–10 a series of seven experiments was carried out at the Dairy School, Kilmarnock. The object was to discover how best to utilise separated milk and whey in pig feeding, and what meals or mixtures of meals might be profitably used to replace or supplement the liquid food.

Five experiments were conducted between 1905 and 1908 with lots of young pigs. The number in each lot was eight in 1905 and four or five in succeeding years. All the lots were kept under the same general conditions. The pigs received practically an *ad lib.* quantity of food, though careful record was kept of the quantities actually consumed. The meals were not cooked or scalded, but were soaked for about twelve hours in cold water. Except in one case, where the effect of cold foods was tested, the food was given warm. In 1905 the foods used were:—(1) Separated milk and barley meal; (2) whey and barley meal; (3) water, barley meal, and a little bran; (4) whey and maize meal; (5) whey and Paisley meal (the latter a local by-product of maize, rich in abuminoids and oil); (6) whey alone. These were repeated in two experiments in 1906, with the addition of whey and Paisley meal fed cold. In 1907–8, in addition, one lot was fed on whey and barley meal during the first twenty-eight days of the feeding period,

on whey and a mixture of barley meal and maize meal during the second twenty-eight days, and on whey and maize meal during the remainder of the experiment. In another lot this order was reversed.

It was found that whey was profitably utilised when fed alone to pigs, though the return was not nearly so great as when it was partly replaced by some of the meals. Taking an average of the whole experiments, it was found that pigs fed on whey alone increased in live weight at the rate of 1 lb. per day, and gave a return of $\frac{1}{2}d.$ per gallon for the whey and a further sum of 8*s.* 7*d.* per pig towards other expenses.

On the whole, when meal was fed in addition to the whey there was a greater and more rapid increase in live weight. Of the meals given with whey, maize meal produced over the whole experiments the greatest average increase, and pigs fed on it gave the best returns for the meal and whey consumed. It likewise gave a better return than the changing of meals during the feeding period. The proportion of maize meal to whey which gave the best return was 2 lb. meal to $2\frac{1}{2}$ gallons whey on an average, with a smaller quantity of meal earlier, and a larger quantity later, in the feeding period. Whey and Paisley meal proved more profitable than whey and barley meal; in fact, the latter food failed to show a better return than whey alone.

The results obtained from a comparison of separated milk and barley meal with whey and barley meal showed that the relative values of separated milk and whey for bacon production were as 3 to 2.

The single test on the question showed that to produce the same increase $12\frac{1}{2}$ per cent. less dry matter was required with warm food than with cold.

The amount of dry matter in the food required to produce 1 lb. increase in live weight varied with the kind of food, the live weight of the pig, and other conditions. In general, most was required when whey was fed alone, and least when maize meal and whey were fed in the proportion of 2 lb. to $2\frac{1}{2}$ gallons. The bacon-producing values of separated milk, whey, and meals respectively were found to be increased when the liquid and solid foods were combined.

The quantity of food required to produce an increase of 1 lb. live weight grew in proportion to the weight of the pig. At 214 lb. it required 50 per cent. more food for the same increase than at 118 lb., and 19 per cent. more than the average amount required by animals of 118 to 214 lb. live weight. The live weight of the pigs increased from 100 to 210 lb. in nine or ten weeks (an average rate of 1·72 lb. per head per day) when fed on separated milk and barley meal. When the ration was maize meal and whey it required eleven weeks to produce the same increase (an average rate of 1·49 lb. per day).

Pigs fed on whey and maize meal gave the highest percentage of carcass weight to liveweight, and of bacon to carcass weight.

Barley meal without skim milk or whey produced a bacon inferior in quality to that from meals given with milk or whey. Barley meal and separated milk gave in every case the best quality of bacon. When whey was used in such quantity as to provide a considerable proportion of the dry matter of the food a good quality of bacon was obtained with all the meals.

In 1909 and 1910 tests were made with (1) whey and a mixture of equal parts barley meal and maize meal; (2) same as (1) with addition of cooked potatoes; (3) same as (1) with addition of uncooked potatoes; (4) whey and a mixture of two parts barley meal to one part rice meal; (5) whey and a mixture of equal parts barley meal and Paisley meal.

On the average of these two last experiments whey, with a mixture of equal parts barley and maize meal, gave the best results, both as regards live weight increase and the balance remaining after paying for food consumed; while the barley meal and Paisley meal mixture proved better than the barley meal and rice meal. Neither Lot 2 nor Lot 3 gave any return for the potatoes supplied.

Pork Production with Forage Crops (*Univ. of Missouri, Agric. Expt. Sta., Bull.* 95).—This bulletin gives the results of experiments carried out with the object of determining what forage crops are the most suitable and economical for feeding pigs. In an introduction to the report it is stated that with increased prices of grain and feeding stuffs of all kinds, the greater use of cheap forage crops must be looked to, to reduce the cost of producing pork. The forage crops tried included maize and rye, lucerne, peas, soy beans, red clover, blue grass, rape and oats.

The general plan of the experiment was as follows :—The hogs used were of early spring farrow, weighing at the commencement about 50 to 70 lb., live weight. Each forage was supplemented with grain, in quantities sufficient to produce a standard and equal rate of gain, the object aimed at being to have the animals from 125 lb. to 150 lb. live weight, at the end of the experiment. The experiments were carried out in the three summers 1908, 1909, and 1910, with the following results :—

Lucerne gave better returns than any other forage. The best system of using it appeared to be to supplement it with 2 lb. of maize per day for every 100 lb. live weight of the animal. In 1910 the total gain per acre in live weight of pigs pastured on lucerne was 1,310 lb., though, in addition to the lucerne, 4,022 lb. of maize was fed.

Red clover ranked next to lucerne as a forage plant for pigs. It did not feed so many per acre and also had a shorter forage season, but it fitted better into the rotation systems. In 1910, the only year in which it could be compared with lucerne, red clover produced an increase in live weight of 1,050 lb. per acre, though, in addition to the pasture, the pigs received 2,872 lb. of maize.

The bulletin suggests that the following is the best system of using the clover :—While the clover is growing rapidly about a pound a head of grain per day should be given; when in bloom (and it should not be pastured so closely but that it will bloom) little or no supplementary food need be given, as pigs are fond of clover heads, and will make satisfactory gain without grain. At other times from 3 to 5 lb. of grain per head per day may be given.

Rape did not give such good returns as clover and lucerne. The best results were obtained when it was sown along with oats and red clover, the latter being left to stand over till the following year.

It was found difficult sometimes to get the pigs to eat rape when first turned on to it.

Sorghum, peas, soy beans, rye, and maize were also tried as forage crops, but the results were not so good as with clover and lucerne.

The following conclusions are drawn from the experiments :—

1. The use of forage crops in the production of pork is more economical than full feeding on heavy grain rations.

2. Gains made on forage are made at 20 to 30 per cent. less cost than gains produced by grain feeding alone.

3. In 1910 the increase in live weight produced per acre by lucerne (after deducting the increase due to the grain fed) was 596 lb.

4. Red clover ranked among the first as a hog forage, because of the palatability of the feed throughout the season, and also because of its adaptability to rotations. In 1910 the average increase in live weight per acre (after deducting the increase due to the grain fed) was 572 lb.

FORESTRY.

Method of Planting Forest Trees (*Roy. Agric. Coll., Cirencester, Scientific Bull., No.* 2, 1910).—An experiment was made to ascertain whether the results obtained at the Woburn Experimental Fruit Farm in the planting of fruit trees would be borne out in the case of forest trees. The land used was old pasture, with a deep and somewhat heavy soil. Twenty four-year-old trees were planted of each of the following kinds : oak, ash, beech, spruce, Corsican pine, and Scots pine, and the planting was carried out as follows :—Ten trees of each kind were planted in pits, every care being taken to give the roots enough room; the finer soil was placed round the roots, and the whole carefully and firmly trodden down. The other ten trees were planted in very shallow pits, into which the roots were merely pushed anyhow, the soil placed on the top in thin layers, and well rammed with a heavy iron rammer. No care was taken not to injure the roots. The trees were lifted and weighed after two years, but the number was too small to give reliable averages. It is noted, however, that no more of the rammed and carelessly planted trees died than of the others, and in general appearance the two sets could not be distinguished. An examination of the roots confirmed Mr. Pickering's former conclusions that great care in digging holes and carefully spreading out the roots is not of much importance, as in many cases the old roots do not throw out new roots to any extent, while it is important to see that trees are put quite firm in the ground, although ramming would be too expensive for ordinary planting.

HORTICULTURE.

Fruit Bud Formation (*New Hampshire Agric. Expt. Sta., Bull. No.* 153).—Investigations were begun in 1908 into the effects of certain methods of cultivation, manuring, and cropping of the soil on the formation of fruit buds on apple trees. An orchard consisting of over 200 trees, nearly all Baldwins, and about twenty-five years old, was chosen, and divided up into eleven plots. It would be inadvisable to draw definite conclusions from an experiment extending over such a short time, but reviewing the results up to 1910, it is clear that

cultivation was the most influential factor affecting the production of fruit buds and of fruit. It is concluded that this was effective owing to its conserving the moisture in the soil. The next most important influence appeared to be the supply of nitrogen by means of a leguminous crop grown as a green manure.

Treatment of Old Orchards (*Trans. Mass. Horticultural Soc.*, 1911, *Pt.* 1).—Some suggestions for the renovation of old orchards are given in this publication which may be compared with the treatment advocated in Leaflet 70.

It is recommended that all dead or worthless trees should in the first place be removed and burnt, as they harbour insect and fungus pests. The ground about the trees should be kept clear of waste material. Two or three years must of necessity elapse before the old trees can be properly pruned, on account of their low vitality. The dead wood and growths of shoots, suckers, &c., must be removed, and at the first treatment the tree should be pruned slightly to open the top. If the desired top is obtained in three years the result should be considered satisfactory. The physical condition of the tree being dependent upon the leaves, the growth of the latter should be stimulated by a heavy dressing of nitrogenous manures, *e.g.*, 10 lb. per tree of the following dressing applied early in May before the appearance of the leaves :—700 lb. nitrate of soda, 300 lb. sulphate of ammonia, 460 lb. sulphate of potash, 440 lb. superphosphate, and 100 lb. kainit.

Trunks and large branches should be thoroughly scraped to remove eggs, &c., under the bark, care being taken not to injure the new wood. Trunks and branches should also be scrubbed at the beginning of April with a lime and caustic potash wash.

By the time the tree is pruned it approaches its normal condition, and more radical steps can be taken to protect it from pests and diseases. Lasting injury is almost certain to result from attempts to spray before the tree reaches its normal condition.

Subsequent manuring is largely a matter for individual experiment, but 15 lb. per tree annually of the following dressing is suggested :—300 lb. nitrate of soda, 300 lb. bone meal, 1,000 lb. basic slag, and 400 lb. sulphate of potash. Grafts should be made from varieties with high reproductive power.

OFFICIAL NOTICES AND CIRCULARS.

Report on Grants for Agricultural Education and Research, 1910–11.

The Report of the Board of Agriculture and Fisheries on the Distribution of Grants for Agricultural Education and Research in 1910–11 has recently been issued [Cd. 6025, price 3*d.*] During 1909 the Treasury sanctioned a considerable increase in the Board's Estimates in respect of these grants, and the amount distributed in aid of educational institutions increased from £12,300 in 1909–10 to £18,840 in 1910–11. Most of the Institutions which usually participate in these grants accordingly received aid on a higher scale than heretofore. In addition to these amounts, which are primarily for the promotion of agricultural educa-

tion, a sum of £425 was allotted in the course of the year in the form of special grants for experiments and research.

Acreage and Live-Stock Returns.

The Board have recently issued Part I. of the Agricultural Statistics for 1911 [Cd. 6021, price 5½*d.*], containing the returns of the acreage of crops and number of live stock in Great Britain as collected in June, 1911, together with summaries for the United Kingdom. A preliminary statement containing the totals for Great Britain was issued on September 26th.

Report of the Intelligence Division, 1910-11.

Part II. of the Report of the Intelligence Division of the Board, on the proceedings under the Destructive Insects and Pests Acts, 1877 and 1907, and the Board of Agriculture Act, 1889, for the year 1910–11 has been published [Cd. 6020, price 2*s.* 1*d.*], and gives an account of the work accomplished by the Division between April 1st, 1910, and March 31st, 1911, especially in regard to the measures for combating American Gooseberry Mildew and Wart Disease of potatoes, and to investigations on the Large Larch Sawfly and the Isle of Wight Bee Disease. Maps are given in the Report showing the number of cases and the amount of American Gooseberry Mildew, the distribution of the Large Larch Sawfly, and the intensity of Wart Disease in 1910–11.

Issue of Certificates Required in Connection with the Exportation of Plants.

With a view to assist nurserymen in Great Britain to develop their export trade, the Board of Agriculture and Fisheries are prepared to issue the certificates required by the Governments of the countries and colonies to which plants are to be exported under the following conditions.

1. In cases in which consignments of plants or bulbs are only admitted on production of a certificate by the Board, or by one of their Inspectors, that the contents have been examined and declared to be healthy or free from certain specified pests, application should be made to the Board a few days before the consignment is to be dispatched. When the parcel does not weigh more than 7 lb., and it is to be sent by parcel post, the plants should be sent ready packed in a box, with the lid not nailed down, to The Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., marked on the outside "Plants (or bulbs) for export." If it is desired that the parcel should be dispatched by the Board, after the certificate has been signed, a prepaid adhesive label addressed to the consignee should be enclosed, and the Customs declaration form required by the Postal Regulations (Post Office Guide, p. 772) should be filled up and affixed to the box.

The necessary fee must also be enclosed if it is desired that the parcel should be insured, but it must be understood that the Board cannot, in any case, accept any responsibility for any loss or damage which may arise.

No charge is made for the Board's certificate unless the parcel is

over 7 lb. in weight or the Inspector is required for any reason to travel to the place where the consignment is to be examined. In this case a charge of £2 2*s*. will be made, which must be paid before the certificate can be issued.

2. In cases in which consignments of plants are only admitted on production of a certificate from the Board that the nursery in which they have been grown has been examined and found to be free from certain specified pests, application for the attendance of an Inspector must be made before May 1st each year, in order that the nursery may be examined from time to time during the summer. A fee of £2 2*s*. will be charged for the certificate, and the remittance must be sent to the Board not less than a month before the beginning of the shipping season.

3. In cases in which a certificate of the Board is required stating that no disease of a certain kind has been reported from the neighbourhood in which the plants were grown a declaration signed (and in some cases sworn) by the grower must be sent, stating that the plants (in most cases potatoes) were grown on a particular farm, and naming the parish and county in which such premises are situate, together with a declaration that the disease in respect of which the certificate is issued has not occurred on those premises.

The application should be received by the Board not less than three days before the consignment is to be dispatched. No charge is made for this certificate.

In cases in which the certificates required do not fall within any of the foregoing categories nurserymen who wish to export plants should apply to the Board for further particulars.

Importation Regulations.

Importation of Live Stock into British West African Colonies.—The Board have received, through the Colonial Office, the following information relating to the importation of cattle into the British West African Colonies and Protectorates :—

Northern Nigeria.—There are no laws in force for the prevention of the introduction of contagious diseases.

Southern Nigeria.—The Prevention of Disease (Animals) Ordinance of 1908 empowers the Governor in Council to make rules prohibiting the importation of animals, and such rules may provide for the establishment and maintenance of quarantine stations for animals and for slaughtering diseased animals with or without compensation, or animals suspected of being diseased, with compensation.

There is, however, no regular examination of animals entering the Colony.

Gold Coast.—Ordinance No. 10 of 1876 empowers the Governor to prohibit the importation of infected live stock.

Sierra Leone.—There are no laws for the prevention of the introduction of contagious diseases of animals.

Gambia.—The Prevention of Disease (Animals) Ordinance of 1909 empowers the Governor in Council to make rules similar to those under the Ordinance of 1908 of Southern Nigeria.

Importation of Animals into German East Africa.—The *Deutsches Kolonialblatt* of December 1st contains a decree of the Governor-General of German East Africa, dated August 15th, 1911, prohibiting

the importation into German East Africa of cattle and other cloven-footed animals from European countries. (*Board of Trade Journal*, December 14th, 1911.)

Agricultural Exhibition Abroad.

International Agricultural Exhibition at the Hague in 1913.—A national and international agricultural exhibition will be held at the Hague in August, 1913, under the auspices of the Royal Netherland Agricultural Society. Two sections only of the exhibition will be open to international exhibits, viz., agricultural implements and agricultural buildings. The implements section will be divided into four classes—(1) for exhibits of Dutch and foreign manufactured implements and machinery; (2) for exhibits of implements and machinery made in rural districts; (3) for exhibits of new or improved implements; and (4) trials of implements. The section for agricultural buildings will be divided into two classes—(1) for building materials; (2) for actual buildings or models, drawings, and photographs. Full particulars as to the exhibition may be obtained from the Secretary of the Royal Netherland Agricultural Society, Buitenhof, 42, the Hague, Holland.

Miscellaneous Notes.

Action of the International Agricultural Institute with regard to Plant Diseases.—The International Institute of Agriculture drew attention in 1909 to the importance of disseminating information as to methods of combating plant diseases and to the desirability of effective control of plant diseases on the part of the various Governments adhering to the Institute. The adhering countries were also asked by the Institute to consider the possibility of establishing a service for the control of plant diseases or of developing their existing service.

A Bureau of Agricultural Intelligence and Plant Diseases has been formed at the Institute, and as a preliminary measure a monograph* has been published giving an account of the actual organisations existing in different countries for the control of plant diseases. The Bureau also commenced the publication in November, 1910, of a monthly bulletin containing summaries of articles in agricultural periodicals and in the publications of laboratories and experimental stations having reference to plant diseases.

The Institute recognised, however, that, in addition to this passive side of its work in connection with plant diseases, it had an active duty to perform by bringing about international arrangements whereby the combating of plant diseases could be more effectively carried on. Proposals were made at the General Assembly of the Institute in December, 1909, by which State-controlled experimental stations in the different countries should conduct research work according to a given plan. Advice was asked of experts in Italy, France, Germany, and the United Kingdom, and great divergence of opinion was found to exist as to the general utility of the proposal. It was therefore proposed at the last General Assembly of the Institute in May, 1911, that a programme of work as to plant diseases in which the co-operation of the different countries is desirable should be drawn up by an

* *Institut International d'Agriculture, Bureau des Renseignements Agricoles et des Maladies des Plantes.*—L'Organisation actuel du service de protection contre les maladies des plantes et les insectes nuisibles dans les divers pays (223 pp.). Rome, 1911.

international commission formed of members chosen by the adhering States. It was suggested in the first place that a report should be prepared drawing the attention of the different Governments to the necessity for the formation of an international commission of vegetable pathology. The committee further recommended that the General Assembly should ask the adhering Governments to invite their stations of vegetable pathology to communicate to the Institute without delay the results of their work and investigations, above all of those dealing with the efficacy of remedies for plant diseases, with a view to their publication in the monthly bulletin of the Institute.

Visitors to Kew Gardens during 1911.—The number of visitors to the Royal Botanic Gardens, Kew, during the year 1911 was 3,704,606. These figures represent an increase of 158,304 persons over the year 1910, when there were 3,546,302 visitors, and are the highest yet recorded.

The steady annual growth in the number of visitors during the past twenty years witnesses to the ever-increasing popularity of Kew Gardens.

Year.	Sundays.	Week-days.	Total.
1893–1902 (average)	—	—	1,352,425
1903	568,726	783,822	1,352,548
1904	675,225	904,441	1,579,666
1905	853,631	970,688	1,824,319
1906	867,148	1,472,344	2,339,492
1907	1,268,501	1,694,213	2,962,714
1908	1,321,384	1,388,836	2,710,220
1909	1,384,369	1,975,852	3,360,221
1910	1,614,085	1,932,217	3,546,302
1911	1,517,650	2,186,956	3,704,606

The month in which the largest number of persons visited the Gardens was July, when 737,946 visitors were recorded. There were 157,425 visitors on June 5th, 1911.

Inferiority of Wool owing to Presence of Coloured Hairs.—At the annual meeting of the British Association of Wool Buyers in 1911 a complaint was made that in recent years much wool had to be classed as of inferior quality owing to the presence in the wool of hairs other than white. It was stated that wool buyers had found that farmers had been crossing breeds so much that even in the most unlikely districts grey hairs were present in the wool, and that, in consequence, the wool was unsuitable for the more valuable yarns, and could not be purchased. It was often found, for example, that farmers in the north of England crossed their North or Cheviot ewes with an Oxford ram. Other causes of inferior quality referred to were the use of a dip that discoloured the wool, and the employment of tar for branding sheep.

World's Production and Consumption of Wool.—The following information regarding the production and consumption of wool is extracted from the report by the President of the French Permanent Customs Values Commission on the foreign trade of France in 1910 :—

The number of sheep in Europe is steadily decreasing; the increase in the yield of wool per sheep has up to the present kept the output of

wool on the Continent almost constant, but this will soon cease to be the case, since the yield per sheep cannot increase much in the future. The North American flocks should increase in size, at any rate for some years to come. The Australian flocks, temporarily lessened by drought, have again begun to increase. The number of sheep in Australia and New Zealand increased from 110,480,000 in 1909 to 115,450,000 in 1910. The yield of wool per sheep has also increased considerably, thanks to judicious crossing, selection, and the infusion of merino blood. In the Argentine the flocks moved into colder regions bore the change of climate very well. The drought of 1909 destroyed many lambs and greatly reduced the output of wool in 1910, but there is stated to be an improvement this year (1911).

The world's *production* of wool in 1910 is estimated at 26,369,000 cwt. Making allowance for the quantities consumed by local industries in the countries of exportation, the supplies available for the manufacturers of Europe and North America were as follows :—

	cwt.
Production of—	
Continent of Europe	3,744,000
United Kingdom	1,275,000
North America	2,968,000
Exports from—	
Australasia	7,622,000
Argentine and Uruguay	3,860,000
South Africa	1,114,000
Other countries outside Europe	2,113,000
Total	22,696,000

The quantity available in 1909 amounted to 23,106,000 cwt. The supply for the manufacturing countries was thus about the same in 1910 as in the preceding year; the supply from Australasia increased by 7 per cent., and that from other exporting countries decreased.

The *consumption* of wool has grown very slowly in the last decade, increasing during the ten years 1901–10 by only 13 per cent. In 1910 there was an increase, as compared with 1909, in the consumption in Europe, and especially in the United Kingdom, and a considerable decline in that in North America. The consumption of raw wool during the year 1910 is estimated to be as follows (*Board of Trade Journal*, November 16th, 1911) :—

Continent of Europe	12,684,000
United Kingdom	5,463,000
North America	4,546,000

Notes on Agriculture Abroad.

Cattle Breeding in Paraguay.—The following information with regard to cattle breeding in Paraguay is given in *F.O. Report* No. 4815 (Annual Series) on the trade of that country in 1910 :—

Cattle breeding is the principal industry in Paraguay. Both the country and the climate are exceedingly favourable and the rate of reproduction is remarkably high. There is abundance of water, and the animals are not subject to serious diseases. A mild form of foot-and-mouth disease appears, however, to be common, and was prevalent throughout the country during 1910. Land suitable for cattle fetches from £600 to £2,000 per league (4,860 acres). The latter price would be for the best land well situated as regards communications by

rail or river. Land in the Chaco, a part of the country that is little known and almost entirely undeveloped, is cheaper. Some of the lands that are ordinarily suitable for cattle raising are liable to inundation. There is a good demand for cattle, both for local consumption and for the factories of preserved meat and meat extract. The average price of animals weighing 190 to 200 kilos (420 to 440 lb.) is about £3 in winter and £2 15*s.* in summer at the capital and less in the country districts, but prices vary greatly with local conditions. Ox-hides sell at about 4*d.* per lb. and cow-hides at 3*d.* per lb. According to the latest census, taken in 1902, the total number of animals in the country was 3,104,453, but the number is probably greater to-day. Horse breeding in Paraguay, on the other hand, does not thrive, owing chiefly to the prevalence of the *mal de cadeira,* a fatal disease which attacks horses and goats, and the cause of which is at present unknown.

Government Aid to Live Stock Breeding in Argentina.—A report by the United States Consul at Buenos Aires states that a Bill has passed the Argentine Chamber of Deputies granting a Government bounty to the first freezing works erected in the province of Entre Rios. The bounty is to be paid for five years, and will consist of about 8*s.* 6*d.* per head for cattle and about 1*s.* 8*d.* per head for sheep exported. The live stock industry in other provinces is considered to be on a satisfactory basis, and not in need of State protection. (*U.S. Daily Consular and Trade Reports,* November 17th, 1911.)

Cattle and Meat Industry in Argentina.—The British Acting-Consul at Buenos Aires (Mr. F. G. Rule) has forwarded copies of a pamphlet issued by the Argentine Agricultural Society, giving detailed information on Argentine stock-breeding, the export of live stock, and the frozen meat industry, and containing also an article on the local development of scientific agriculture. A few copies are available for distribution.

Pedigree Live Stock Imported into Argentina, 1901–1910.—The following particulars regarding the importation into Argentina of pedigree stock of various classes and breeds during the period 1901–1910 is given in "Argentina: its Agriculture and Live Stock in 1910" (*Anales de la Sociedad Rural Argentina*):—

Cattle.—Shorthorn, 8,661; Hereford, 339; Polled Angus, 370; Red Polled, 98; Jersey, 92; various, 124; total 9,684. The total value of these 9,684 animals was £1,268,646, or £131 per head.

Sheep.—Lincoln, 22,985; Merinos, 566; Hampshire, 1,441; Shropshire, 1,590; Romney Marsh, 1,139; various, 1,172; total, 28,893. The total value of these 28,893 animals was £378,511, or £13 2*s.* per head.

Horses.—Percheron, 1,003; Clydesdale, 696; Shire, 365; Hackney, 438; Yorkshire, 89; Suffolk, 56; Anglo-Norman, 75; Shetland, 71; Pony, 31; Arab, 17; various, 595; total, 3,436. The total value of these 3,436 animals was £450,131, or £131 per head.

Asses.—French, 105; Spanish, 835; Italian, 3; various, 17; total, 960. The total value of these 960 animals was £67,048, or £70 per head.

Pigs.—Yorkshire, 440; Berkshire, 1,795; various, 409; total, 2,644. The total value of these 2,644 animals was £23,092, or £8 14*s.* per head.

The total value of pedigree stock of all kinds imported in the ten years was £2,187,454.

Agriculture in Siberia.—An account of agriculture in Siberia is given in a report by H.M. Vice-Consul at Omsk (*F.O. Repts., Annual Series,* No. 4801).

Cereals.—The future of Siberia is considered to lie in the export of dairy produce rather than grain. Although, owing to the large immigration, more land is coming into cultivation yearly, and the production is increasing, the export of cereals does not increase in proportion, as the home demand also increases, some parts of Asiatic Russia consuming more than they produce. A result of the increased immigration is that the Russian peasant is no longer able to take up fresh land every year, and it now happens that the same crop is grown on the same land year after year, with moderate results if the summer is wet, but with poor results if the summer is dry. It seems to be the general opinion that the grain export will not have any very great future, because freight on the railway and cartage for long distances to the railway, prohibit the grain being sold otherwise than at a loss to the farmer, and, in consequence, he sells only in those years in which he has an excess. It is probable that, in the near future, all grain not required for home consumption or for seeding will be used for feeding cattle or pigs.

Butter.—The principal export from Siberia is butter. Most of the butter is exported through foreign firms, who have either their agents or their own branches in the butter-exporting districts. Several attempts at exporting have been made by syndicates of dairy associations, but these have not been able to compete successfully with private exporters. The quality of Siberian butter, according to reports, is improving, owing to more careful grading on the part of the exporters, and dairy owners are endeavouring to obtain good dairymen, in order to reap the benefit of the higher prices paid for butter of superior quality—the more so as the demand for second- and third-class qualities is greatly decreasing, not only from the United Kingdom and the Continental countries, but from European Russia also.

The exports of butter are chiefly to the United Kingdom and Germany, these countries having taken nearly one-half and one-third respectively of the total exports, both in 1909 and 1910. The demand from European Russia and the Far East is steadily increasing, however.

Live Stock.—Cattle in Siberia are principally bred for dairy purposes, but on the Steppes the Kirghese breed cattle for food. This business has very little interest for people abroad, as practically all cattle slaughtered are for local consumption.

The export of pigs is increasing, and it is believed that the figures for 1910 would be about 50,000 pigs.

The quality is not first class, a fair proportion being apparently good secondary, the rest poor; but the high prices for bacon which existed in the United Kingdom during 1910 have been a great help to a young industry. However, with lower prices abroad and a crop failure in Siberia during 1911, the business will be thrown back for a time.

Undoubtedly when the breed of pigs improves, as it will do in Siberia, in the same way as in other countries, and with normal prices, there will be a great export, and people interested in the

business would do well to keep their eyes upon it, as in the future bacon will probably be the second most important export from Siberia, and the United Kingdom will certainly be the chief market.

Agricultural Machinery in Poland.—The following particulars are taken from a report by H.M. Consul at Warsaw :—

In Poland the sale of agricultural machinery is extensive, and promises to increase yearly as the cost of manual labour is enhanced. The cutting up of large estates into small holdings increases the number of cultivating units, and both the Government and agricultural societies are trying to encourage the small farmers and peasants to buy machinery and implements, in order to improve the system of cultivation. Important results have already been obtained in this direction.

In 1910, for the first time, steam ploughs were introduced into Poland. Two were brought from the United Kingdom and some from Austria-Hungary, but their future success is a matter of divided opinion, many holding that the majority of the Polish estates are too small, and that farm labour is not dear enough yet to warrant the heavy expenses connected with the purchase and working of these machines.

The local manufacture of implements and machines is slowly but steadily developing, despite the present tariff facilities offered for the importation of foreign goods in this line.

Demand for Fertilisers in Poland.—The following information is from the report by H.M. Consul at Warsaw (Mr. C. Clive Bayley) on the trade of Poland and Grodno in 1910 :—

The use of fertilisers is becoming much more general in Poland, not only on large estates, but also among farmers, and in some districts among the peasants. The various agricultural societies and peasant associations afford their members facilities for purchasing fertilisers, in order to encourage their use, and the efforts of these associations are meeting with great success. In order to increase the output of cereals on peasant lands the Russian Government is proposing measures such as the granting of subsidies to agricultural societies, and the sale of fertilisers to the peasants on long terms of credit. The fertilisers most used at present are superphosphates, basic slag, nitrate of soda, sulphate of ammonia, and potassium salts.

The price of superphosphates, quoted by the Artificial Manure Syndicate, per 1 per cent. of soluble phosphoric acid in 100 lb., delivered free at any railway station in Poland, was 2·28*d*. in the spring of 1910, and 2·34*d*. in the autumn. As the output of the local works is insufficient to meet the demand, large quantities are imported, chiefly from Silesia and Posen. The manufacturers in those districts have adapted themselves to the Polish demands as regards quality, and, being always ready to grant four to six months' credit, can compete successfully with Polish works. The only real condition disadvantageous to British firms competing with the local and German firms is the question of greater freight charges. Unless, however, British firms are prepared to extend a similar amount of credit it is not the least use trying to enter the Polish market.

Basic slag is imported from Germany and Belgium; the prices paid during the year were 1·90*d*. to 1·96*d*. per 1 per cent. of phosphoric acid soluble in citric acid in 100 lb., delivered free at any station in Poland.

Nearly all the Belgian slag was imported *via* Dantzig, and competed successfully against the German product. Here again, adds the Consul, is an excellent opening for British exporters, provided they will give four to six months' credit, and can supply high-graded slag containing at least 17 per cent. of phosphoric acid soluble in citric acid.

Demand for Agricultural Machinery in Bulgaria.—H.M. Vice-Consul at Sofia, in reporting on the trade of Bulgaria in 1910, states that machinery ploughs are supplied in Bulgaria on easy terms by the Agricultural Bank and its provincial agencies. In the case of larger machinery, farmers co-operate to purchase threshers and reapers, &c., which are provided by the bank for 40 per cent. cash, the machines themselves being the security for the remaining 60 per cent. The agricultural society and the Magasin National of Sofia provide machinery on similar terms, most of it being ordered in Austria-Hungary and Germany.

According to statistics published in 1909, there were at work throughout the country 398,000 native and 84,000 modern ploughs, 761 drills, 4,156 reapers, 611 threshers, and 73,700 other agricultural machines.

Possibility of an Export of Guano from Assumption Island, Seychelles.—The possibility of an export of guano from Assumption Island, Seychelles, is discussed in a report recently prepared by the curator of the Botanic Station in the Seychelles.

The guano, it appears, occurs on the island in two forms, viz., as a shallow formation over the surface, and in pits which have become gradually filled with guano as a result of the washing action of rain water. The amount of surface guano available is estimated at 270,000 tons, and of pit guano about 106,000 tons. The latter is stated to be of the best quality, much richer, in fact, than the surface guano, since the action of percolating water in the pits removes much of the organic matter and increases the proportion of phosphate of lime. (*Bulletin of the Imperial Institute,* Vol. IX., No. 1, 1911.)

Agricultural Machinery in Smyrna.—A memorandum on the increase in the use of agricultural machinery in the province of Smyrna, Turkey, has been received from H.M. Vice-Consul at Smyrna (Mr. Heathcote Smith), in which it is stated that a demonstration train was run through the province for nearly 40 days in the autumn of 1909, carrying specimens of agricultural machines, which were exhibited and submitted to practical trials at all the principal agricultural centres.

Great interest was aroused by comparative tests between the local wooden plough and European ploughs. The representatives for the English machines arranged for a dynamometer to be fixed on to the different ploughs when working, and, its reading being very simple, the peasants were able to follow the demonstration with ease. The increased use of ploughs is seen from the figures relating to imports into the province; these were, in 1908, 1,649, valued at £1,773; in 1909, 5,113, valued at £6,013; in 1910, 4,728, valued at £4,386; and in 1911 (eleven months only), 8,756, valued at £8,045. The imports of harrows, reapers, reaper-binders, mowers, threshers, traction engines, vine sprayers, and machine parts is also increasing.

Notes on the Weather in January.

The weather in the *first* week of the new year (December 31st to January 6th) was very dull generally, with occasional rain in all districts. Snow and sleet were experienced in the North Midlands and the north and north-east of Britain generally on the 6th. Heavy rainfall was experienced all over the country, except in the east and west of Scotland; warmth was everywhere "unusual," the excess of temperature above the average being more than 6° in several English districts. Bright sunshine was generally less than the normal.

During the *second* week a generally unsettled condition prevailed, with much snow and sleet early in the period in the more northern districts, and occasional rain subsequently. In the east and south of England rain was less frequent than elsewhere. Temperature was lower than during preceding weeks, but was again above the average except in England N.E. Bright sunshine was below the normal in the eastern districts, but was above it over England N.W. and Scotland W. and N.

The weather continued unsettled throughout the *third* week, with heavy falls of rain, sleet, or snow during the earlier half of the period, and of rain in many places during the later days. Nearly every part of Great Britain experienced snow, but in the south-east and south of England it was very slight. Warmth was everywhere "moderate," and sunshine "scanty," or "very scanty." No sunshine was recorded during the week in the east of England.

During the greater part of the *fourth* week the conditions continued very unsettled over all the southern, eastern, and south-western parts of England, with much cloud and frequent falls of rain, while slight precipitation also occurred in the east of Scotland. Late in the week a marked improvement took place over the whole country. Much mist and fog was experienced from time to time in England. Over the whole week temperature was below the average, while the amount of rainfall and bright sunshine recorded varied greatly in different districts.

Agricultural Conditions in Great Britain on February 1st.

The Crop Reporters of the Board, in reporting on agricultural conditions on February 1st, refer to the very wet weather prevailing throughout the country during the first three weeks of January, and state that the autumn-sown crops all looked healthy and vigorous, with the exception of a few pieces on heavy or low-lying lands, where the plant was sometimes thin or weak. The sharp frosts (which were accompanied by heavy snow in the midlands and north) during the last week of the month were generally welcomed, and allowed arrears of farm work, such as carting manure, to be performed.

Lambing in the south of England has not progressed very favourably. Reports as to the fall of lambs are rather variable, some putting it as about average, and others as rather less. But there seems to be very generally a rather heavy mortality among the lambs or the ewes —particularly among ewes in Somerset and Dorset. Complaints are also numerous that the ewes are in poor condition—owing partly to the wet and partly to the shortness of roots; that they are not giving

normal quantities of milk; or that the lambs are weak or difficult to rear. Where lambing has not begun, ewes—owing largely to scarcity of suitable food—are mostly in poor condition, and a certain amount of apprehension is consequently felt as to the prospects. In Scotland, ewes have generally come through the winter fairly well, although there are some exceptions, and the position there is better than in the south.

Stock can be said to have wintered only fairly well. Cattle are generally healthy, but often in rather poor condition and backward. Sheep are less satisfactory, and heavy mortality is reported from some districts. The very open winter has, until recently, allowed of stock being out more than usual, and the scanty stores of roots, hay, and straw have thereby been economised. But these supplies, as well as artificial foods, had to be drawn upon when the frosts came, and it is feared that there may be much scarcity should the spring prove late. In some cases the shortness of keep is reported to have led to a certain number of cattle being marketed in an unfinished condition.

Notes on Crop Prospects Abroad.

The *Bulletin of Agricultural Statistics* for January, 1912, issued by the International Institute of Agriculture, gives the final returns of the production of the cereal crops last year in Norway, Sweden, and Canada. Estimates are also given of the acreage sown with winter cereals in several countries of the northern hemisphere.

Norway.—The total production of each of the four cereal crops—wheat, barley, oats, and rye—in 1911 was less than that of the previous year; the wheat crop of 34,000 qr. was 14 per cent. less; barley, 322,000 qr., 10 per cent. less; oats, 1,045,000 qr., 15 per cent. less; and rye, 110,000 qr., 11 per cent. less than in 1910.

Sweden.—The production of wheat in 1911 was 1,029,000 qr., $9\frac{1}{2}$ per cent. more than in 1910, but that of barley and oats was $5\frac{1}{2}$ and 14 per cent. respectively less than in 1910, the production of barley being 1,763,000 qr., and oats 7,789,000 qr. in 1911. Rye was returned at 2,879,000 qr., being very slightly greater than in 1910.

Canada.—The final harvest returns showed a marked increase in the case of wheat as compared with the preliminary returns, the production being 26,974,000 qr., or 1,607,000 qr. more than previously estimated. The production in 1911 was 44 per cent. greater than that of 1910 in the case of wheat, but that of barley, 4,875,000 qr., was 10 per cent. less. Oats were $7\frac{1}{2}$ per cent. more than in 1910, being returned at 37,933,000 qr., whilst maize, which was returned at 2,190,000 qr., showed very little change from the previous year.

New Zealand.—The area placed under wheat in 1911 was 216,000 acres, under barley 32,000 acres, and under oats 404,000 acres. The acreage of oats increased 34 per cent. as compared with 1910, but that of wheat and barley decreased 33 and 4 per cent. respectively.

Planting of Winter Cereals.—The areas estimated to have been sown to *wheat* up to December 31st, 1911, compared with the areas sown during the corresponding period of 1910, expressed as percentages, are as follows:—Belgium, 104; Denmark, 100; Spain, 95; France, 112; Great Britain, 106; Luxemburg, 102; Switzerland, 100; Canada, 97; United States, 99; and India, 99. (The figures for India

refer to about 89 per cent. of the total reported wheat area of India.) The areas sown to *rye* are, for Belgium, Denmark, and Switzerland, 100; Spain, 90; France, 96; Luxemburg, 102; and United States, 101. The areas sown to *barley* are:—Belgium, 107; Spain, 90; France, 114; Luxemburg, 112; and Switzerland, 100; and to *oats,* Spain, 105; France, 107.

The weather during the sowing season was generally favourable; germination was uniform, and a good plant was obtained. The wet and mild weather during December provoked too rapid a growth in France, and weeds were becoming troublesome, whilst in Ireland some resowing may be necessary on account of flooding in some low-lying areas.

Bulletin of Agricultural Statistics, Supplement, January, 1912.—The production of wheat in *Argentina* in 1911–12 is estimated to be 21,315,000 qr., as against 17,035,000 qr. in 1910–11, or an excess of 25·1 per cent. The production of oats is estimated to be 6,238,000 qr., as compared with 3,741,000 qr. last year, or an increase of 66·7 per cent. The production of maize is estimated at 32,142,000 qr., as against 3,214,000 qr. last year, when a large part of the area had to be abandoned.

New Zealand.—The production of wheat in 1911–12 is estimated to be 811,000 qr., as compared with 1,034,000 qr. in 1910–11, or a decrease of 21·6 per cent.; and the production of oats, 1,917,000 qr., as against 1,261,000 qr. in 1910–11, an increase of 52 per cent.

The total production of wheat in Argentina, Chili, Australia, and New Zealand is estimated to be 36,363,000 qr. in 1911–12, as compared with 34,467,000 qr. in 1910–11, or an increase of 5·5 per cent.

Russia.—H.M. Ambassador at St. Petersburg transmits a report on the condition of the young crops in December, 1911. The information refers to 78 of the 91 governments of the Empire, and comprises European Russia, Poland, the Caucasus, Western Siberia, the Steppes, and Turkestan. In the remaining governments practically no crops have yet been sown, or the information was too scanty for use. The condition of the young crops was "entirely favourable." In the great majority of the governments (65 out of 78) the condition was "above satisfactory." In nine governments it was "satisfactory," and only in four governments "unsatisfactory." The absence of snow and frost in many governments causes fear for the well-being of the crops, as they may suffer from wet and cold. Little change has taken place as compared with their condition a month ago.

United States.—The weather is seasonable. The Government report on the condition of the winter wheat on February 1st states that the fields are mostly protected by snow, and there has been very little alternate freezing and thawing. (*Beerbohm's Evening Corn Trade List,* February 9th, 1912.)

Production of Cider and Perry in France.—According to the report of the French Ministry of Agriculture, the production of cider and perry in France during 1911 is estimated at 481,766,000 gallons, as compared with 237,485,000 gallons in 1910. (*Journal Officiel,* January 12th, 1912.)

Prevalence of Animal Diseases on the Continent.

The following statement shows that, according to the information in the possession of the Board on February 1st, 1912, certain diseases of animals existed in the countries specified :—

Austria (*for the period January 18th—24th*).
Anthrax, Blackleg, Foot-and-Mouth Disease (total of 8,183 Höfe now infected), Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever, Tuberculosis.

Belgium (*for the period December 1st—15th*).
Anthrax, Blackleg, Foot-and-Mouth Disease (358 "foyers" in 224 "communes"), Rabies, Sheep-scab.

Bulgaria (*for the period December 29th—January 6th*).
Anthrax, Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Fever.

Denmark (*month of December*).
Anthrax, Foot-and-Mouth Disease (278 cases), Swine Erysipelas.

France (*month of December*).
Anthrax, Blackleg, Foot-and-Mouth Disease (5,954 "étables" in 2,110 "communes"), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (*for the period January 1st—15th*).
Foot-and-Mouth Disease (7,881 infected places in 3,133 parishes), Glanders and Farcy, Swine Fever.

Holland (*month of December*).
Anthrax, Foot-and-Mouth Disease (302 outbreaks in 11 provinces), Foot-rot, Rabies, Swine Erysipelas.

Hungary (*for the period January 4th—10th*).
Anthrax, Foot-and-Mouth Disease (total of 4,800 "cours" now infected), Glanders and Farcy, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Swine Fever.

Italy (*for the period December 18th—24th*).
Anthrax, Blackleg, Foot-and-Mouth Disease (142 new cases entailing 2,921 animals), Glanders and Farcy, Sheep-scab, Swine Fever.

Montenegro (*for the period October 1st—15th*).
Foot-and-Mouth Disease (96 "étables" infected in 13 "communes"), Glanders.

Norway (*month of December*).
Anthrax, Blackleg.

Roumania (*for the period December 20th—January 5th*).
Dourine, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Russia (*month of September*).
Anthrax, Foot-and-Mouth Disease (281,448 animals in 4,063 "communes"), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Servia (*for the period December 23rd—30th*).
Glanders and Farcy.

Spain (*month of November*).
Anthrax, Blackleg, Dourine, Foot-and-Mouth Disease (102,972 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (month of December).

Anthrax, Blackleg.

Switzerland (for the period January 15th—21st).

Anthrax, Blackleg, Foot-and-Mouth Disease (143 "étables" entailing 2,176 animals, of which 34 "étables" were declared during the period), Swine Fever.

Agricultural Labour in England during January.

The Board of Agriculture and Fisheries have been furnished by the Board of Trade with the following report, based on returns from correspondents in various districts, on the demand for agricultural labour in January :—

Outdoor employment was hindered by bad weather in January, and labourers not attached to the staff of a farm lost time in consequence. There was the usual seasonal slackness in the demand for such extra men, and though the supply was also more limited than usual, a surplus was reported in a number of districts. Their work chiefly consisted in threshing, hedging, and carting and spreading manure.

Northern Counties.—There was but little employment for extra labourers in these counties during January. The number of such men who sought work was also small, and, apart from several days on which outdoor work was stopped by bad weather, generally about balanced the demand. An excess in the supply was, however, reported in the Stockton-on-Tees (*Durham*), West Ward (*Westmorland*), and Leyburn, Pickering, and Sherburn (*Yorkshire*) Rural Districts.

Midland Counties.—Rain and snow interrupted the employment of extra labourers somewhat considerably in these counties. When the weather permitted there was a moderate demand for men for such work as hedging and ditching, repairing fences, threshing, and carting manure, but the supply was in many cases in excess of requirements.

Eastern Counties.—A good deal of time was lost by extra labourers employed at threshing. The partial failure of the root crops was further accountable for irregularity of employment for extra men, particularly in *Norfolk* and *Suffolk,* where the supply was in excess of the demand in many districts.

Southern and South-Western Counties.—Extra labourers were in moderate demand for threshing, hedging, ditching, draining and manuring land, but their employment was generally somewhat irregular. An excess of such men was reported from several districts in *Surrey* and *Hampshire,* and also from the Chailey (*Sussex*) and Westbury and Cricklade (*Wiltshire*) Rural Districts; certain correspondents referred to the demand for extra men in their districts being smaller than usual on account of the forward state of farm work. Men for permanent situations were still reported as scarce in the Godstone (*Surrey*), the Stow-on-the-Wold and Thornbury (*Gloucestershire*), and the South Molton (*Devon*) Rural Districts.

THE CORN MARKETS IN JANUARY.

C. KAINS JACKSON.

Wheat.—Business was slow in recovering after the Christmas holidays, and mild weather for the season made the first fortnight of January a difficult period for sellers. Prices, however, did not go back, as the imports and home deliveries combined were below the level of consumption. The third week of the month was marked by 6*d.* per quarter advance in all sorts of imported wheat, and when in the fourth week severe frosts set in the exchanges showed prompt improvement. January closed with imported wheat about 1*s.* 6*d.* per qr. dearer for most sorts, and 2*s.* for fine Canadian, of which the scarcity seems serious. Home-grown wheat is between 6*d.* and 1*s.* dearer, but with improved condition is expected to come into line with imported descriptions. During the damp and mild period samples did not give that satisfaction which with a dry and frosty atmosphere they may be expected to afford to millers. The intrinsic high quality of this season's English wheat is remarkable, and extends to all parts of the country, even to some of those districts of the west, where high quality is decidedly rare.

The stocks of imported wheat in the fifteen great ports at the end of the month were about 1,700,000 qr., against about 2,600,000 qr. a year previously. The supply of wheat on passage was 2,375,000 qr., against 2,315,000 qr., so that the statistical situation gave a total of 4,075,000 qr., against 4,915,000 qr. The effect was decidedly bullish, and would have been much more so but for the supply of wheat in merchants' hands in the United States and Canada. The American Republic has seen a very free sale of wheat by farmers since harvest, so that merchants now hold 8,900,000 qr., against 6,560,000 qr. on January 31st, 1911. Canada has a large crop, and farmers have passed over to merchants 5,355,000 qr., against 2,745,000 qr. last season. The Canadian new crop is grading badly, however, only about 25 per cent. reaching the two top standards which in a sound average year are reached by a moiety of the crop, and in an "ideal" year for quality should amount to as much as 75 per cent. of the whole. It is believed that as much as three million quarters of the Canadian surplus will be used for feeding live stock rather than for flour. At Mark Lane there has been a difficulty in securing the famous Canadian wheat with 14 to 15 per cent. of dry gluten. It is now costing 10*s.* per qr. above the average price of English, and the nearest types, such as Saxonka and good North Russian, are not plentiful. The quality of the new Australian crop is said to be a good average. This cannot be said of the new La Plata yield; the quality is regarded as only medium, and the condition of early shipments is said to leave much to be desired.

January shipments were 849,000 qr. from North America, 95,000 from South America, 536,000 from Russia, 696,000 from Europe S.E., 466,000 from India, and 583,000 from Australasia. January, 1911, showed a materially heavier aggregate. The month closed with Indian wheat at Mark Lane fetching 37*s.* to 38*s.* per 492 lb.; Australian, 38*s.*

to 39*s.* per 480 lb.; Russian, 36*s.* to 41*s.*, according to cleanness and quality; and Canadian, 34*s.* to 43*s.* 6*d.*—an immense range. At Liverpool, American red winter, the leading sort there, was held for 7*s.* 9*d.* per cental.

Flour.—Shipments of United States and Canadian sorts in January did not exceed 370,000 sacks to England and Europe. At least half a million were expected, and thus the market has been gradually hardening for both these sorts. The advance of Town Whites to 31*s.* was a corollary of the rise in wheat which had by some been regarded as overdue, even on late December wheat quotations. It has carried with it Town Households up to 28*s.*, No. 2 Households to 26*s.* 9*d.*, and wholemeal to 28*s.*, and while country flour, owing to large supplies into London, is little dearer on the month, February expectations on the 1st of the month were certainly in sellers' favour. The supply on passage, 134,000 sacks, is very small.

Barley.—Remarkable averages have continued to be recorded from some of the counties, Kentish returns in especial being high. Part of the ostensible rise in barley must probably be attributed to the unusually large use of feeding quality on the farm. If the grower only sends to market malting grade a high average naturally results. Towards the end of January a good demand for seed corn was manifested. Imported barley has been in full average supply, but inquiry is so much above the average for barley meal that grinding sorts are dearer than ever. The profits on pig fattening are affected by this rise in feeding barley. Russia in January shipped 896,000 qr., Europe S.E., 186,000 qr., but the Continent has continued to buy freely, and only 330,000 qr. were on passage to the United Kingdom at the end of the month. Prices at the close included 28*s.* 6*d.* to 29*s.* for 400 lb. Russian, and 27*s.* 6*d.* to 28*s.* for Indian.

Oats.—The excellent demand for 304 lb. descriptions has met with curiously little response from shippers. During January Russia sent off 722,000 qr., Europe S.E. 131,000 qr., and Argentina 162,000 qr., but these were a decidedly smaller aggregate than the figures for January, 1911, when prices were some shillings lower, and the crops of Argentina and Canada smaller. The last-named country has hardly yet begun to ship a crop estimated as giving a clear seven million quarters exportable surplus; yet the price which Mark Lane is now bidding for Canadian 320 lb. oats is 22*s.* 6*d.* per qr. The month closed with only 150,000 qr. of oats on passage from all sources, but La Plata was understood to have contracted for about half a million quarters to be shipped before the close of February. An even larger trade is expected for March.

Maize.—The United States in January shipped 596,000 qr. only, against 920,000 qr. and 837,000 qr. in the two preceding Januarys. This partial failure of expected new crop shipments caused flat and mixed corn to appreciate, and a dear market was experienced where easier buying had been the anticipation. Round corn was shipped from Russia to the extent of 390,000 qr., and 798,000 qr., a very large total, was exported by Europe S.E. The total world shipments, despite the efforts of the European region, were decidedly below the average, and the month closed with less than 400,000 qr. on the high seas. Prices at Mark Lane were 31*s.* for American, Odessa, and Calcutta,

33*s.* 6*d.* for white African. Burma offered prompt shipments at £6 16*s.* 3*d.* per ton direct to London, cost, freight, and insurance.

Oilseeds.—American competition for linseed is less than it was at this time last year, and the new crop in Argentina is decidedly heavier. Prices accordingly are expected during the next few months to be easier than they have recently been. There seems, however, to be little practical anticipation of linseed falling below 16*s.* per cwt. either for Argentine or for Calcutta, while 17*s.* to 18*s.* is likely to be demanded for English, Russian, and Bombay, which sorts are the pick of the market.

Various.—The general dearness of fattening foods leads to beet sugar being in request; 15*s.* per cwt. is about the lowest quotation. Some mixed feeding stuffs may be quoted as follows:—Pigeon beans, 50*s.* per 532 lb.; small round peas, 74*s.* per 504 lb.; Indian chick peas, 30*s.* per 504 lb.; Essex rye, 33*s.* per 480 lb.; Indian millet, 28*s.* per 480 lb.; Sussex gores, 88*s.* per 532 lb.; Argentine canaryseed, 45*s.* per 464 lb.; and Russian buckwheat, 7*s.* 6*d.* per cental. There is a busier trade than usual in the minor products.

THE LIVE AND DEAD MEAT TRADE IN JANUARY.

A. T. MATTHEWS.

Fat Cattle.—Trade ruled very firm throughout the month. Supplies were moderate, and the average condition of animals offered was fully as good as could be expected in view of the exceptional difficulties of feeders, owing to the scarcity of roots and the very high cost of concentrated feeding stuffs. A notable feature at the Metropolitan Market was the unusually liberal supplies of Irish bullocks, the condition of which was quite equal to the normal. At the market held on the 22nd, fully half of the cattle exposed had been shipped from Dublin and Waterford. These useful cattle have helped to compensate for the falling off in the usual supply from the Norfolk yards.

The following averages for cattle in English markets are calculated for the four weeks ended January 25th:—Shorthorns, 8*s.* 8*d.* for first, and 7*s.* 9*d.* for second quality, against 8*s.* 9*d.* and 7*s.* 9*d.* in December; Herefords, 8*s.* 11*d.* and 8*s.* 3*d.*, against 8*s.* 9*d.* and 8*s.*; Devons, 9*s.* and 7*s.* 11*d.*, against 8*s.* 11*d.* and 7*s.* 11*d.*; Welsh Runts, 8*s.* 8*d.* and 7*s.* 10*d.*, against 8*s.* 6*d.* and 7*s.* 9*d.*; Polled Scots, 9*s.* and 8*s.* 3*d.*, against 8*s.* 11*d.* and 8*s.* 3*d.* per 14 lb. stone. It will be seen that in most of these classes there was some advance. As regards the immediate future, it is considered improbable that the present supplies can be maintained.

Veal Calves.—There was a very good demand for the time of year, and average prices were very steady. These were 8½*d.* and 7½*d.* per lb. in the leading British markets, this being an advance of ¼*d.* per lb. on the prices ruling in December.

Fat Sheep.—For the first three weeks of the new year values remained about stationary, but in the fourth week there was a very decided advance of ¼*d.* per lb. in the average of British markets.

Under the present conditions any general improvement in the condition and quality was out of the question, and large numbers of tegs have been coming forward for forced sale, which, in ordinary seasons, would not be sold till March and April. Consequently they are only half fattened, and fetch very poor prices per head. It is highly probable that, such being the case, the values per lb. have been under-estimated, and butchers have complained very much of disappointment at results when sheep have come to be weighed. We are thus mortgaging our future supplies, and a serious shortage is looked for in the spring. The January averages for Downs in about twenty English markets were 8¼*d.*, 7¼*d.*, and 5¾*d.* for the three qualities, and 7½*d.*, 6½*d.*, and 5*d.* for Longwools. This was an improvement of about ¼*d.* on the December prices. A falling off of about 2,000 head in the Islington supplies on the fourth Monday caused a sharp advance in prices, and some of the choicer pens realised as much as 9*d.* per lb. Looking back to the summer prices of last year, it will be found that sheep are now about 1*d.* per lb. dearer than at the lowest point.

Fat Pigs.—After many months of continuous decline, bacon pigs showed a small recovery, averaging in about thirty British markets 6*s.* 3*d.* per 14 lb. for prime small, and 5*s.* 8*d.* for larger pigs. Supplies at some markets show signs of falling off.

Carcass Beef—British.—In the first week fresh-killed beef was dearer than at Christmas in the London markets, and whole sides of Scotch made up to 7*d.* per lb., while English fetched 6¾*d.* The latter was of better quality, relatively, than is often the case at Smithfield. Both met a good, steady trade throughout, but the average prices differed little from those of December. These were 7½*d.* and 7*d.* per lb. for short, and 6½*d.* and 6¾*d.* for long sides of Scotch, and 6½*d.* and 6*d.* for English of first and second quality.

Port-Killed Beef.—Deptford-killed American has again sold well, and has realised in the Central Market exactly the same as English.

Chilled Beef.—North American chilled was again conspicuous by its absence, and Argentine supplies were comparatively moderate. Trade was therefore steady, and prices ruled rather higher than in December, the averages being, for hindquarters, 3*s.* 6*d.* per 8 lb. for first, and 3*s.* for second quality. Forequarters also advanced and realised 2*s.* 4*d.* and 2*s.* per stone.

Frozen Beef.—This class of beef was quietly dealt in, the demand being steady. Its value, however, like that of all other descriptions of beef, tended upwards. Hindquarters averaged 2*s.* 7*d.* per stone for first, and 2*s.* 5*d.* for second quality, and forequarters 2*s.* and 1*s.* 10*d.*

Carcass Mutton—Fresh-Killed.—The trade in British and Dutch mutton has been singularly lifeless, and prices for home-grown have been relatively lower at the dead-meat market than for live sheep at Islington. Scotch sold slowly, and averages were lower than in December. The highest price for small tegs was 4*s.* 6*d.* per stone, or 6¾*d.* per lb., and the averages for the month 4*s.* 5*d.* and 4*s.* per stone for first and second quality. English made 3*s.* 8*d.* to 4*s.*, and Dutch 3*s.* 7*d.* to 4*s.* A little lamb has sold at 10*d.* to 11*d.* per lb.

Frozen Mutton and Lamb.—New Zealand mutton sold steadily at 2*s.* 6*d.* to 3*s.* per 8 lb., and Argentine and Australian at 2*s.* 2*d.* to

2*s*. 5*d*. Canterbury lamb fetched about 3*s*. 8*d*. during the first three weeks, but in the fourth some new season produce arrived which made 4*s*. per stone.

Veal.—There was considerable scarcity of good veal in London, and only in the third week were quotations for British less than 6*s*. and 5*s*. 8*d*. per stone for first and second quality.

Pork.—There were full supplies of both British and Dutch pork and trade was quiet. The former averaged 4*s*. 2*d*. and 3*s*. 9*d*. per stone for first and second quality, and the latter about 2*d*. per 8 lb. less.

Late Markets.—At the Metropolitan Market on the 29th there was no change in the value of cattle, but prime small sheep were dearer, Southdowns realising 9¼*d*. per lb.

There was a very slow trade for dead meat at the London Central Market on the 31st, but there was no material change in prices.

THE PROVISION TRADE IN JANUARY.

HEDLEY STEVENS.

Bacon.—The New Year opened with firmer markets for all descriptions of long sides, and a moderate consumptive demand, but by the end of January quotations were a little lower. All other cuts, especially Cumberlands, bellies, and hams, were in very poor demand, and prices showed greatly in favour of buyers. The demand for hams at this time of year is usually small, but during the past month they were practically unsaleable, and arrivals had to be placed in cold store to await improved conditions of trading. The consumer is not at present getting the full benefit of the lower prices which are ruling, as owing to the fact that the retailer has been selling for many months past at either cost or a loss, he is anxious to recoup himself as far as possible before placing his prices more in line with wholesale values. The arrivals of long sides from Denmark and Russia were fairly free during the month, and at the prices demanded met with a ready sale. On the other hand, the shipments from America and Canada, although of moderate quantities, were more than sufficient for the demand. Prices for spot goods are below those asked by the packers, and in consequence there was very little, if any, contracting done during the month. At all the American markets the receipts of hogs continue much in excess of those at the same time last year. The values at Chicago during the month ranged from $5.60 to $6.40, against $7.60 to $8.25 last year, and $8.00 to $8.90 two years ago.

English pigs are still offered in small quantities only, but prices show little change.

Cheese.—A moderate trade passed during the month, and there was very little alteration in prices. Some holders tried to force up the values of Canadians still further, and this cheese was dearer in January than in December, in spite of the free arrivals of New Zealand makes. At present spot prices are from 14*s*. to 17*s*. per cwt. above those current at the same time last

year, and it is felt by many operators that they are as high as they are likely to go, but others think, with the visible supplies in England, Canada, and the United States much smaller than for many years past, we shall go to 80*s*. before the beginning of April for Canadian and New Zealand makes, as even with the reduced consumption on account of the high prices, there will not be sufficient cheese to fill requirements until the new makes arrive. Some further purchases of best Canadian makes have been made with Canada at from 74*s*. to 75*s*. c.i.f., and practically all stocks available for export have now been sold. Cables from New Zealand still report dry weather, so it is thought that there will not be a large increase in the shipments from that country, as anticipated.

At the end of the month the estimated stock of Canadian cheese at the three principal distributing centres (London, Liverpool, and Bristol) was 206,000 cheese, against 266,000 at the same time last year, and 245,000 two years ago. The stock of New Zealands was 10,000 crates in London and Bristol, against 14,000 at the same time last year.

English cheese was in fair demand at extremely high prices, present rates being from 20*s*. to 24*s*. per cwt. over those current at the same time last year. Supplies were difficult to obtain.

Butter.—Prices fluctuated during the month, and at the close were about 2*s*. to 4*s*. higher than at the end of December. They still show a range of values from 26*s*. to 30*s*. over those of January, 1911, however. It is contended by many interested in the trade that the present prices are the result of the "bull" operations of large speculators, but it is not entirely so. On January 1st, 1911, the public cold stores in London, Liverpool, and Bristol had heavy stocks of butter kept over from the previous summer (which was a wet one), and the losses incurred by the wholesale merchants were very great, the goods having to be sold at under cost of production. We may have slightly reduced prices, but until May next we must expect to have about the present abnormal rates, as a result of the past summer's drought in England and on the Continent. We cannot expect any further shipments, either from Canada or the United States this season, as all available stocks are required for home consumption in those countries, at prices relatively above those current in this country.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND in the Month of January, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	England. First Quality.	England. Second Quality.	Scotland. First Quality.	Scotland. Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots	8 11	8 2	41 9	38 3
Herefords	8 11	8 3	—	—
Shorthorns	8 8	7 9	40 9	37 6
Devons	9 0	7 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8¼	7½	9	7
Sheep:—				
Downs	8¼	7¼	—	—
Longwools	7½	6½	—	—
Cheviots	8½	7½	8	7
Blackfaced	8½	7¼	7½	6½
Cross-breds	8	7	8¼	7¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs:—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 4	5 9	6 1	5 6
Porkers	7 0	6 5	6 7	6 0
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 12	17 16	22 2	18 12
,, —Calvers... ...	21 2	17 5	21 1	17 12
Other Breeds—In Milk ...	17 19	15 7	18 17	15 6
,, —Calvers ...	—	11 15	19 16	16 0
Calves for Rearing	2 1	1 11	2 17	2 1
Store Cattle:—				
Shorthorns—Yearlings ...	9 13	8 8	10 9	8 17
,, —Two-year-olds...	13 10	11 16	14 8	12 17
,, —Three-year-olds	16 15	15 9	16 5	13 14
Polled Scots—Two-year-olds	—	—	17 5	14 11
Herefords— ,,	15 17	13 19	—	—
Devons— ,,	14 14	12 11	—	—
Store Sheep:—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	33 9	26 10	—	—
Scotch Cross-breds ...	—	—	30 6	24 9
Store Pigs:—				
8 to 10 weeks old	13 7	9 9	17 6	13 5
12 to 16 weeks old	22 3	16 3	—	—

* Estimated carcass weight.

† Live weight

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1912

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Liverpool.	London.	Manchester.	Edinburgh.	Glasgow.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—							
English	1st	58 6	59 0	61 0	57 0	59 0*	60 6*
	2nd	54 6	54 0	56 6	53 6	54 0*	57 6*
Cow and Bull ...	1st	48 6	46 6	48 6	49 6	50 0	48 6
	2nd	43 6	42 0	43 6	45 6	44 6	44 6
U.S.A. and Canadian :—							
Port Killed ...	1st	58 6	59 0	61 0	58 6	—	—
	2nd	53 6	53 6	57 6	—	—	—
Argentine Frozen—							
Hind Quarters...	1st	36 0	35 6	36 6	35 6	35 6	36 6
Fore ,, ...	1st	27 6	27 0	28 6	27 0	27 6	27 6
Argentine Chilled—							
Hind Quarters...	1st	46 6	46 6	47 0	48 0	47 0	46 6
Fore ,, ...	1st	31 6	29 6	32 6	29 6	32 0	32 0
Australian Frozen—							
Hind Quarters...	1st	35 6	34 0	36 0	34 0	—	34 6
Fore ,, ...	1st	28 0	25 0	28 0	25 0	—	26 6
VEAL :—							
British	1st	61 0	77 0	81 6	77 0	—	70 0
	2nd	56 0	69 6	76 0	70 6	—	—
Foreign	1st	—	—	81 6	—	80 0	65 6
MUTTON :—							
Scotch	1st	—	69 6	62 0	68 0	61 6	68 0
	2nd	—	64 6	56 0	64 6	54 0	48 0
English	1st	60 6	62 6	56 6	63 6	—	—
	2nd	56 6	56 6	52 0	57 6	—	—
Argentine Frozen ...	1st	35 0	35 0	34 0	35 0	34 6	34 0
Australian ,, ...	1st	33 0	32 6	33 0	32 6	—	32 6
New Zealand ,, ...	1st	—	—	42 0	—	—	—
LAMB :—							
British	1st	—	—	102 6	—	—	—
	2nd	—	—	93 6	—	—	—
New Zealand ...	1st	50 0	49 0	51 6	49 0	—	—
Australian	1st	47 0	40 0	45 0	40 0	—	39 6
Argentine	1st	43 6	41 0	45 0	41 0	—	39 6
PORK :—							
British	1st	60 6	62 0	57 6	63 0	55 6	56 0
	2nd	56 0	53 6	52 0	57 6	48 6	50 6
Foreign	1st	—	—	54 0	—	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1910, 1911 and 1912.

Weeks ended (*in* 1912).	WHEAT.						BARLEY.						OATS.					
	1910.		1911.		1912.		1910.		1911.		1912.		1910.		1911.		1912.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	33	6	30	5	33	2	24	11	23	11	33	3	17	2	17	0	20	7
,, 13 ...	33	8	30	8	33	1	24	11	23	10	33	0	17	7	17	2	20	8
,, 20 ...	33	9	30	11	33	4	24	11	24	4	33	3	17	6	17	4	20	11
,, 27 ...	33	6	30	11	33	7	25	0	24	5	33	1	17	4	17	3	21	1
Feb. 3 ...	33	7	30	9	33	8	24	10	24	5	32	10	17	7	17	5	21	3
,, 10 ...	33	4	30	5			24	9	24	6			17	11	17	5		
,, 17 ...	33	0	30	3			24	6	24	7			18	0	17	6		
,, 24 ...	32	7	30	2			24	2	24	9			17	10	17	7		
Mar. 2 ...	32	7	30	0			24	6	25	0			18	1	17	5		
,, 9 ...	32	6	30	1			24	1	25	0			18	0	17	5		
,, 16 ...	32	6	30	1			23	6	24	11			18	0	17	6		
,, 23 ...	32	9	30	2			23	7	25	0			17	11	17	5		
,, 30 ...	33	0	30	3			23	8	24	11			18	0	17	5		
Apl. 6 ...	33	6	30	4			23	1	24	7			17	11	17	7		
,, 13 ...	33	7	30	3			23	5	25	2			18	3	18	3		
,, 20 ...	33	7	30	4			23	0	25	5			18	3	17	10		
,, 27 ...	33	0	30	11			22	10	25	5			18	3	18	3		
May 4 ...	32	6	31	4			22	7	25	7			18	2	18	6		
,, 11 ...	32	1	31	8			22	0	25	1			18	1	19	0		
,, 18 ...	31	10	32	6			21	8	25	4			17	8	19	2		
,, 25 ...	31	3	32	8			21	4	25	0			17	10	19	5		
June 1 ...	30	2	32	5			21	8	24	10			17	10	19	5		
,, 8 ...	29	1	32	4			20	9	25	7			17	10	19	7		
,, 15 ...	29	0	32	3			18	11	23	11			18	0	19	8		
,, 22 ...	29	4	31	11			20	1	23	9			17	9	19	10		
,, 29 ...	29	9	31	10			19	11	24	5			17	7	19	9		
July 6 ...	30	4	32	1			19	5	25	10			17	4	19	9		
,, 13 ...	31	1	32	3			21	3	25	10			17	7	19	11		
,, 20 ...	31	11	32	5			19	9	24	3			17	5	19	5		
,, 27 ...	33	5	32	5			20	10	23	8			18	1	19	7		
Aug. 3 ..	33	9	32	0			20	5	24	4			18	3	18	2		
,, 10 ...	33	5	31	6			20	4	26	9			18	0	18	0		
,, 17 ...	32	11	31	6			20	11	27	8			17	11	17	10		
,, 24 ..	32	7	31	8			20	10	28	10			17	2	18	0		
,, 31 ...	32	2	31	7			22	10	28	4			17	2	18	3		
Sept. 7 ...	31	11	31	10			23	3	28	4			17	2	18	1		
,, 14 ...	30	11	32	0			24	3	29	0			16	6	18	5		
,, 21 ...	30	2	32	4			24	2	29	11			16	3	18	9		
,, 28 ...	30	1	32	6			24	4	30	5			16	4	19	1		
Oct. 5 ...	30	1	32	7			24	7	30	9			16	3	19	5		
,, 12 ...	30	2	32	9			25	1	31	0			16	2	19	10		
,, 19 ...	30	4	32	9			25	3	31	5			16	1	19	11		
,, 26 ...	30	4	33	1			25	4	31	7			16	2	20	6		
Nov. 2 ...	30	4	33	4			25	6	31	10			16	2	20	8		
,, 9 ...	29	11	33	4			25	4	32	7			15	11	20	11		
,, 16 ...	29	8	33	1			25	1	32	10			16	1	21	0		
,, 23 ...	29	11	33	0			24	10	33	5			16	4	20	10		
,, 30 ...	30	6	32	10			24	7	33	10			16	7	20	11		
Dec. 7 ...	30	9	32	9			24	3	34	0			16	9	20	9		
,, 14 ...	30	7	32	11			23	9	33	5			16	10	20	9		
,, 21 ...	30	7	32	9			23	10	33	5			16	9	20	8		
,, 28 ...	30	5	33	0			23	9	33	4			16	9	20	7		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.: Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **Wheat, Barley,** and **Oats** per Imperial Quarter in FRANCE, BELGIUM, and GERMANY, and at PARIS, BERLIN, and BRESLAU.

		WHEAT.		BARLEY.		OATS.	
		1911.	1912.	1911.	1912.	1911.	1912.
		s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
France :	January	46 11	44 4	26 3	28 8	21 6	22 9
Paris :	January	48 3	46 11	26 2	28 8	22 9	23 5
		1910.	1911.	1910.	1911.	1910.	1911.
Belgium :	November	32 3	33 10	22 6	27 11	19 7	22 9
	December	32 9	34 1	22 10	28 11	19 2	23 4
Germany :	November	40 6	42 9	27 11	35 1	20 10	25 0
	December	40 8	43 2	27 8	35 9	20 8	25 3
Berlin :	November	43 0	43 7	—	—	20 6	25 2
	December	43 9	43 9	—	—	20 4	25 10
Breslau :	November	37 9	39 9	26 6* / 22 11†	32 6* / 27 7†	19 9	23 6
	December	37 10	39 11	26 8* / 22 11†	32 10* / 27 7†	19 7	24 1

* Brewing. † Other.

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique* ; the Belgian quotations are the official monthly averages published in the *Moniteur Belge* ; the German quotations are taken from the *Deutscher Reichsanzeiger*, the prices for the German Empire representing the average of the prices at a number of markets.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of January, 1911 and 1912.

	WHEAT.		BARLEY.		OATS.	
	1911.	1912.	1911.	1912.	1911.	1912.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London...	31 10	34 6	23 3	32 3	18 9	22 11
Norwich	30 10	32 11	22 11	33 1	17 8	21 2
Peterborough	30 4	32 9	23 7	30 4	16 10	21 2
Lincoln...	30 2	33 4	24 10	32 11	17 4	21 3
Doncaster	30 6	33 0	23 5	32 6	16 7	20 7
Salisbury	30 5	32 10	23 0	33 4	17 4	20 4

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1912.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Bristol.		Liverpool.		London.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	17 0	15 9	—	—	18 0	16 0	16 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Factory	—	—	123 6	119 6	—	—	—	—
Danish ...	—	—	137 6	135 0	136 6	135 0	133 6	—
French ...	—	—	—	—	145 6	142 6	—	—
Russian ...	127 6	124 0	127 0	124 0	129 0	126 6	122 0	—
Australian ...	134 0	131 6	133 0	130 0	131 6	128 6	133 6	131 0
New Zealand	136 0	132 6	135 0	133 0	133 6	130 6	136 6	135 0
Argentine ...	134 0	132 0	132 0	130 0	130 0	127 0	—	—
CHEESE :—								
British—								
Cheddar ...	93 0	85 0	88 0	84 0	96 0	87 6	79 0	77 0
			120 lb.	120 lb.	120 lb.	120 lb.		
Cheshire ...	—	—	88 6	82 0	95 6	86 0	—	—
			per cwt.	percwt.	per cwt.	per cwt.		
Canadian ...	74 6	73 0	74 0	72 6	75 6	73 6	74 6	—
BACON :—								
Irish	58 6	55 0	59 0	54 6	60 0	57 6	59 0	—
Canadian ...	52 6	50 0	52 6	50 0	53 0	50 6	51 6	—
HAMS :—								
Cumberland ...	—	—	—	—	106 0	93 0	—	—
Irish	—	—	—	—	109 6	97 6	78 0	75 0
American (long cut)	54 6	51 6	55 0	51 6	58 0	54 0	56 6	—
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	18 4	16 8	—	—	16 8	14 9	—	—
Irish	15 9	15 2	14 9	13 7	14 6	12 6	14 4	13 4
Danish ...	—	—	14 7	13 7	16 0	14 9	14 6	14 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton	per ton.	per ton.	per ton.
Edward VII.	90 0	80 0	63 6	60 0	80 0	70 0	—	—
Langworthy ...	85 0	80 0	81 6	76 6	100 0	92 6	70 0	65 0
Up-to-Date ...	85 0	74 0	58 6	55 0	80 6	70 6	60 0	55 0
HAY :—								
Clover ...	115 0	105 0	118 6	96 0	122 0	100 0	86 0	81 0
Meadow ...	110 0	100 0	—	—	116 6	94 6	—	—

DISEASES OF ANIMALS ACTS, 1894 to 1911.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JANUARY.	
	1912.	1911.
Anthrax :—		
Outbreaks	92	85
Animals attacked	101	96
Foot-and-Mouth Disease :—		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy) **:—**		
Outbreaks	13	18
Animals attacked	33	63
Parasitic Mange :—		
Outbreaks	619	—
Animals attacked	1,743	—
Sheep-Scab :—		
Outbreaks	63	123
Swine-Fever :—		
Outbreaks	229	141
Swine Slaughtered as diseased or exposed to infection ...	2,540	1,523

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JANUARY.	
	1912.	1911.
Anthrax :—		
Outbreaks	—	1
Animals attacked	—	1
Glanders (including Farcy) **:—**		
Outbreaks	—	—
Animals attacked	—	—
Parasitic Mange :—		
Outbreaks	8	8
Sheep-Scab :—		
Outbreaks	86	96
Swine-Fever :—		
Outbreaks	11	17
Swine Slaughtered as diseased or exposed to infection ...	146	281

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

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